TECHNOLOGY DEPARTMENT

ROADS AND STREETS

OCTOBER 1948 HIGHWAYS BRIDGES AIRFIELDS HEAVY CONSTRUCTION

PUBLIC LIBRARY
OCT 25 1948
DETROIT

Both need the right union for best results

No removable rock bit can be better than its union, whether it's deep-hardened steel or carbide insert. Even Timken bits would not yield the outstanding performance that is built into them without the Timken union with one-piece, solid steel shoulder construction; neither would they last as long.

The Timken union saves the bit and steel threads by taking the drill impact on the broad, flat machined shoulder of the steel. It increases drilling speed by distributing the hammer blows evenly over the cutting edges of the bit; this also enables the bit to retain its gauge to the limit of its useful life.

The Timken union is a single solid piece of steel — nothing to loosen up under the shock of the hammer blows no matter how hard the rock may be.

The Timken bit and the Timken union are made for each other. There is no other way to obtain Timken rock bit performance.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO
CABLE ADDRESS "TIMROSCO"

prevent this!

use modern treated lumber!

decay termite Protected WITH PENTACHLOROPHENOL

Highway administrators and the crews maintaining signs, guardrails and other public construction are quick to see the advantages of Pentachlorophenol-treated wood.

Men concerned with the budget are impressed by the full strength protection Pentachlorophenol gives against wood decay—protection that *lasts through the years;* that *cuts maintenance costs.* Moreover, workmen like Pentachlorophenol-treated wood because it's clean and easy to handle.

Pentachlorophenol is available in quantity *now.* Capitalize on Pentachlorophenol's *additional* advantages—use Pentachlorophenol-treated posts and lumber.

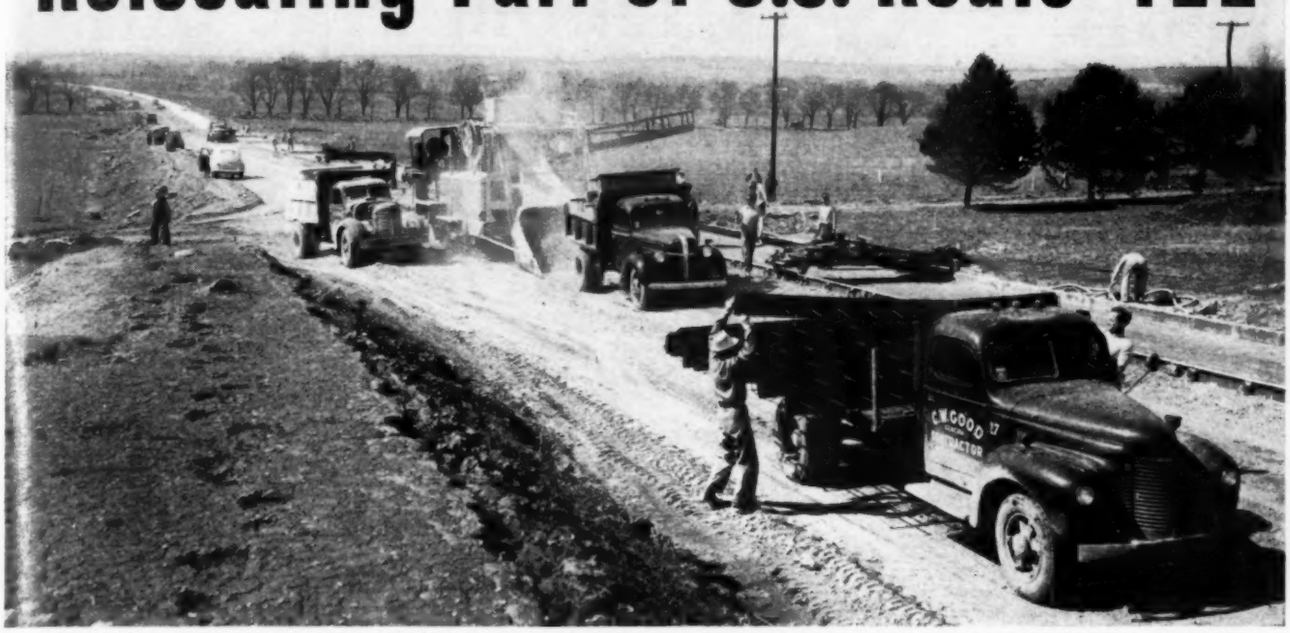
THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

GET THE FACTS TODAY! *Send for free, illustrated booklet telling how Pentachlorophenol adds years to building life. Ask for booklet PE 103.*

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

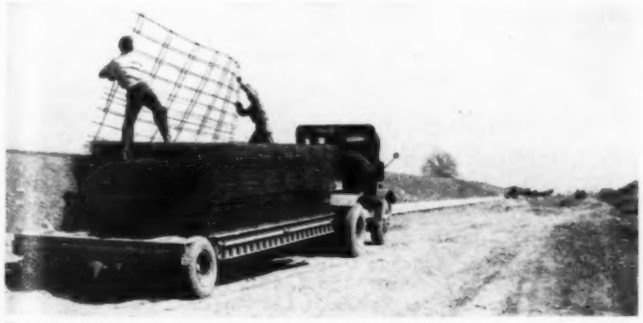
Relocating Part of U.S. Route 422



The dust flies as truck empties load into skip. To keep ahead of paving operations, newly arrived dowel units are unloaded from truck at right.

Scraper wagon and roller lead the parade as grading swings into high gear.

Placing Bethlehem Dowel Unit. For use either as expansion joint or contraction joint, this unit keeps dowels in near-perfect horizontal and vertical alignment



Bethlehem Hinged Bar Mats, popular with road builders because of their remarkable ease of handling and installation, are shown being delivered to job.

Benjamin H. Fager (center), foreman for C. W. Good, Inc., with Wade D. Brandt (left), and M. H. Mosser, inspectors, Pa. Dept. of Highways.

To cope with fast-growing traffic conditions on Route 422, express highway from Philadelphia to Harrisburg, Pa., approximately five miles of relocation were authorized recently in the Robesonia-Sinking Springs area. The new highway is three lanes in width, and includes five reinforced concrete bridges. The accompanying photographs show construction activity being carried out by C. W. Good, Inc., Lancaster, Pa. Reinforcing bars, structural steel, bar mats, dowel units and guard rail were supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
Guard Rail Posts • Wire Rope and Strand • Pipe
Hollow Drill Steel • Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods
Sheet and H-Piling • Fabricated Structural Steel

BETHLEHEM STEEL

ROADS AND STREETS

OCTOBER, 1948 • VOL. 91 • No. 10

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Coming Articles

A County's Graveling Program
Mobile aggregate plants speed production and cut costs on extensive township-cooperative road stabilization program in a Michigan county.

Repaving Chicago's Halsted Street
Talk about traffic difficulties, cement shortage, other grief! A swell job in spite.

Details of Limestone Air Base
Construction features of this immense project which has utilized 600 pieces of equipment.

AASHO at Salt Lake City
Detailed notes from annual meeting of highway officials.

How TNT was Used
Indiana road job involving heavy rock work. A "Contractors at Work" case story.

Emulsified Asphalt and Sand
. . . as used on runway base construction.

Concrete Arch Bridge Methods
How complications of forming and footings were met in building open-spandrel structure on both vertical and horizontal curve.

50,000 C.Y. per Day in Desert Dust
Grading methods employed on dike construction along California's Coachella Canal.

More Expressway Construction Reports
Soon: New York, Pittsburgh, San Antonio, other city progress summaries and construction details.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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HAROLD J. McKEEVER, Editor
C. T. MURRAY, Managing Editor
H. K. GLIDDEN, Contributing Editor
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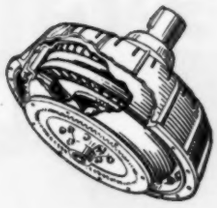
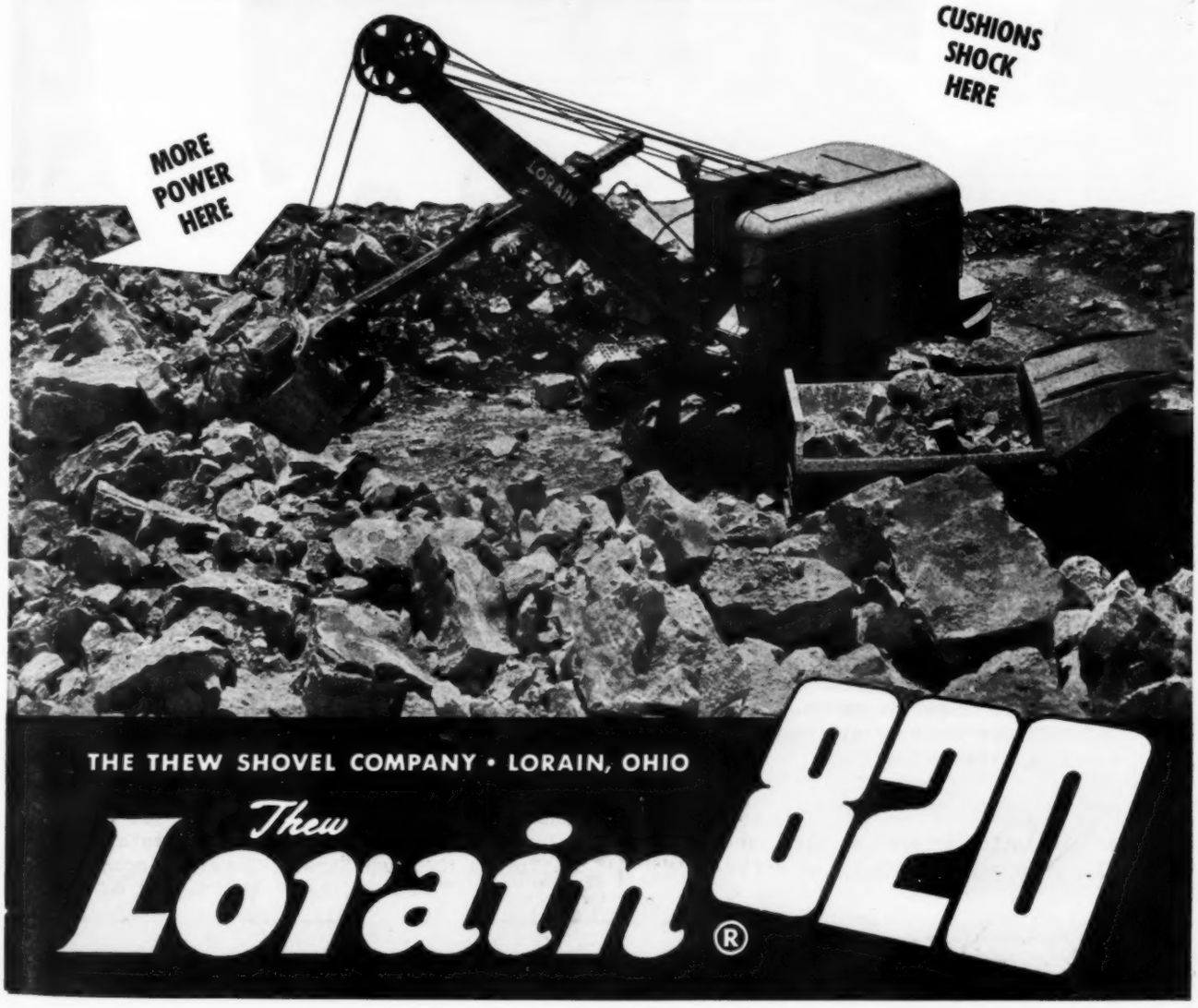
YOU SAVE MONEY AT *Both* ENDS with the hydraulic clutch on the LORAIN-820



THERE'S relentless power back of the dipper of a 2-yd. Lorain-820—power that stays alive, "hangs on" in the most rugged digging, delivers more yardage per day. Yet the inevitable and unavoidable shocks and impacts resulting from such digging aren't "socked" into the turntable. The same Hydraulic Clutch that improves "hang on" and prevents engine stalling also absorbs and cushions shock—swallows up those strains and stresses that can be so costly to cables and mechanism; reduces vibration to a minimum.

More dependable power at the dipper with minimum shock and vibration in the turntable—that's the two-way saving of the Hydraulic Clutch that has helped put the 2-yd. Lorain-820 right at the top among big yardage and profit producers. For complete information, call or write your local Thew-Lorain distributor.



THE THEW SHOVEL COMPANY • LORAIN, OHIO

Thew **Lorain®** **820**

STANDARD ENGINEER'S REPORT

RPM CALOL

TEST DATA

UNIT 6 Cyl. gas Truck + Bus Engine

LUBRICANT RPM Heavy Duty Motor Oil

FUEL Chevron Gasoline

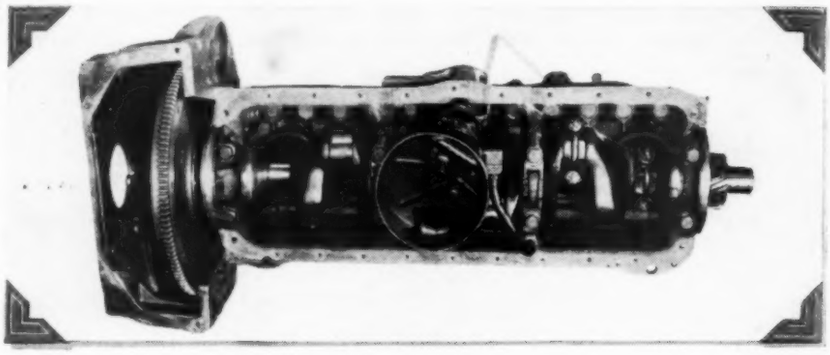
CONDITIONS Max. engine loads for prolonged periods

FIRM Mountain Auto Line

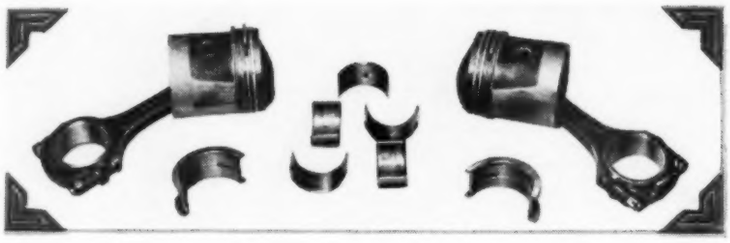
LOCATION San Bernardino, Calif.

TOUGHEST MOUNTAIN SERVICE PROVES RPM HEAVY DUTY KEEPS TRUCK AND BUS ENGINES CLEAN

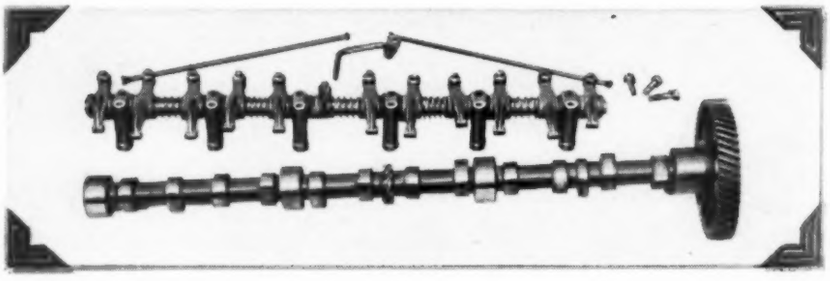
When this engine was pulled out of service for inspection, and the photographs were taken, it had operated on RPM Heavy Duty Motor Oil continuously for 45,000 miles—in service that is about as hard on equipment as any in the country. It is one of 21 units used on a mountain bus and freight run. They climb to a 5000-foot altitude in 15 miles without a stop. Even with 6-bladed fans, pressure-lubricated timing gears and 10-speed transmissions, crankcase temperatures soar above 240 degrees F.



As the pictures at right and above show, the crankshaft, bearings, pistons and rings from the engine were exceptionally clean. RPM Heavy Duty Motor Oil withstands the highest operating temperatures . . . sticks to the hot spots ordinary oils leave bare.



The camshaft was free from lacquer. Pushrods, timing gears and other parts showed minimum wear. RPM Heavy Duty Motor Oil resists oxidation, cleans engines of lacquer and maintains a tough lubricating film. It does this because of inherent properties of its selected base stocks and special compounds.



REMARKS: Many oils, competitive to RPM Heavy Duty Motor Oil, have been tested by Mountain Auto Line in their regular service. Tests have been made in all seasons of the year with atmospheric temperatures ranging from zero to 100°F. above zero in the shade. RPM Heavy Duty Motor Oil is the only oil used that meets every requirement of their engines and prevents clogging with lacquer.

STANDARD TECHNICAL SERVICE conducted and reported this test: If you have a lubrication or fuel problem, your Standard Fuel and Lubricant Engineer or Representative will give you expert help; or write Standard of California, 225 Bush Street, San Francisco 20.

Trademarks, "Calol," "RPM," Reg. U. S. Pat. Off.

STANDARD OF CALIFORNIA • San Francisco, Calif.
THE CALIFORNIA COMPANY • Denver, Colo.
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA OIL COMPANY • New York

the LITTLE MACHINE that gets BIG results!

THE 1/3 YARD SCHIELD BANTAM

TRUCK MOUNTED TRENCH HOE
SHOVEL • CLAM • DRAGLINE
PILEDRIVER • CRANE

NORMAL CAPACITY PER HOUR

- **Shovel or Dragline — 60 yards**
- **Trench Hoe — 100 feet of 5 ft. ditch**

Drive up and dig in. The Schield BANTAM goes into tight spots and gets the job done fast and economically. Its *full circle design* and smooth, *fast cycle operation* pile up profit-making yardage.

Big machine design with *no strain* on center pin, high strength alloy construction throughout. All major assemblies roll on ball bearings for easier handling, longer service life, lower maintenance costs.

Easily changed booms and buckets make the Schield BANTAM 6 machines in one, ready on short notice to speed across town or across country. Mounts on any 1½ ton truck chassis.

For performance that spells profits in excavation and backfill, drainage work, basement digging, handling construction materials, etc., put a Schield BANTAM on the job.

Write for complete details now

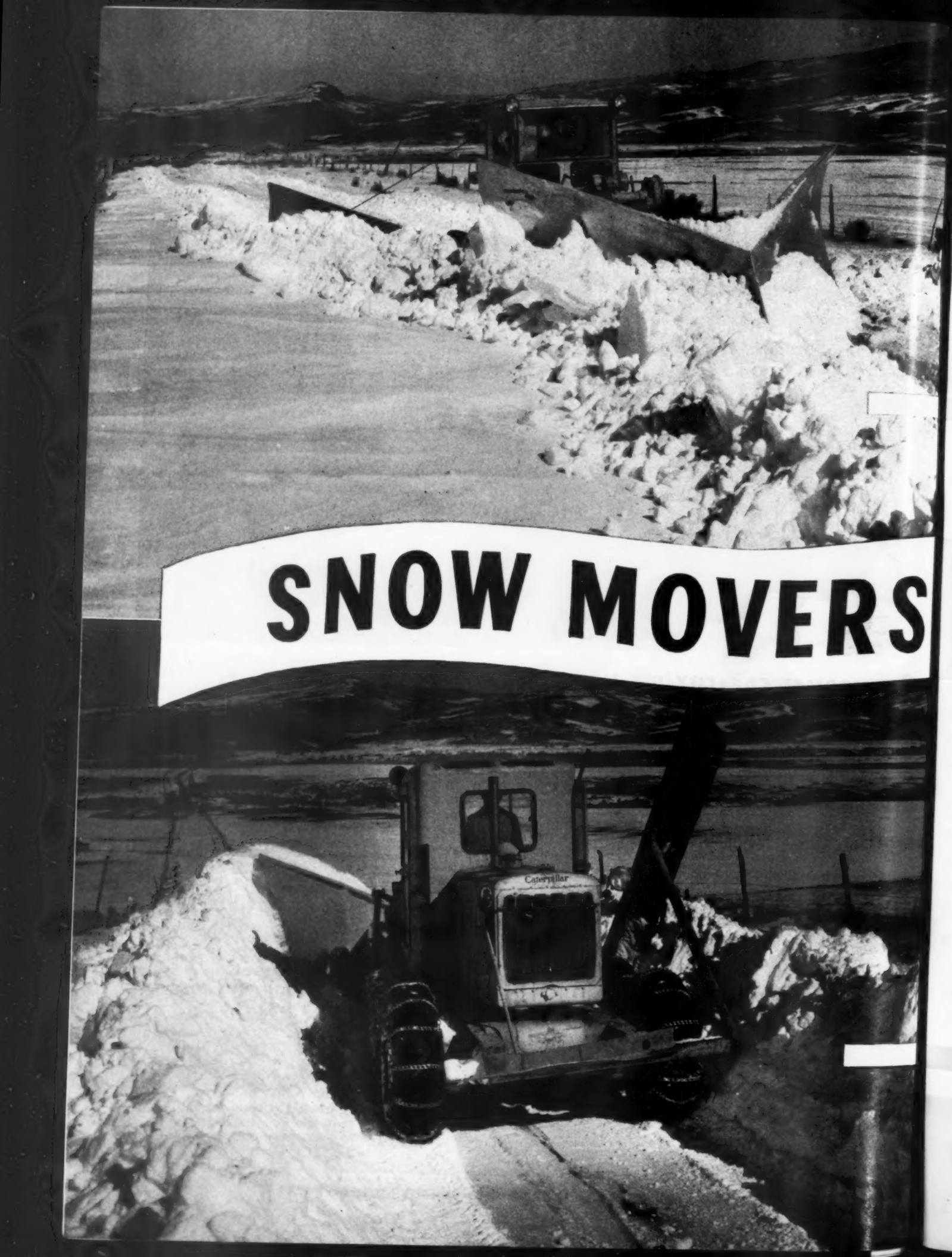
THE SCHIELD BANTAM CO., INC.
203 **Park Street** **Waverly, Iowa**

Fast on the job and fast on the road. The BANTAM Trench Hoe all set to travel.

The BANTAM Shovel is ideal for economical handling of stockpile materials.

Dragline with box boom. The BANTAM is convertible in a matter of minutes.

SOLD AND SERVICED BY LEADING CONSTRUCTION MACHINERY DEALERS
THROUGHOUT THE UNITED STATES, CANADA, AND FOREIGN COUNTRIES


SNOW MOVERS
Caterpillar

COLORADO. These pictures show "Caterpillar" Diesel equipment owned by Routt County. They are typical of hundreds of public-sponsored snow-removal scenes.

• • •

(Left—top and bottom) A No. 12 Motor Grader, with plow and wing, clearing snow from county road east of Hayden. *(Right)* A D7 Tractor, operating 14-ft. plow, opening snowbound road near Steamboat Springs. (Routt County has a total of 600 miles of snow road to plow.)

S THAT "AIN'T KIDDIN'"

Snowbound roads really open up when "Caterpillar" Diesels throw their might into the job.

In tractors it's the combination of brute strength and sure-gripping tracks that drives the biggest plows through the highest and toughest drifts.

In motor graders it's the advantages of tandem-drive wheels with low-pressure tires and engine weight enforcing traction that enable plows and wings to throw snow far back off the shoulders.

Add to winter work their year-round usefulness, and you'll find these versatile machines paying for themselves while they're still young.

Counties, municipalities and contractors know the value of these outstanding units for snow removal, road maintenance and other important work.

CATERPILLAR TRACTOR CO. • PEORIA, ILL.

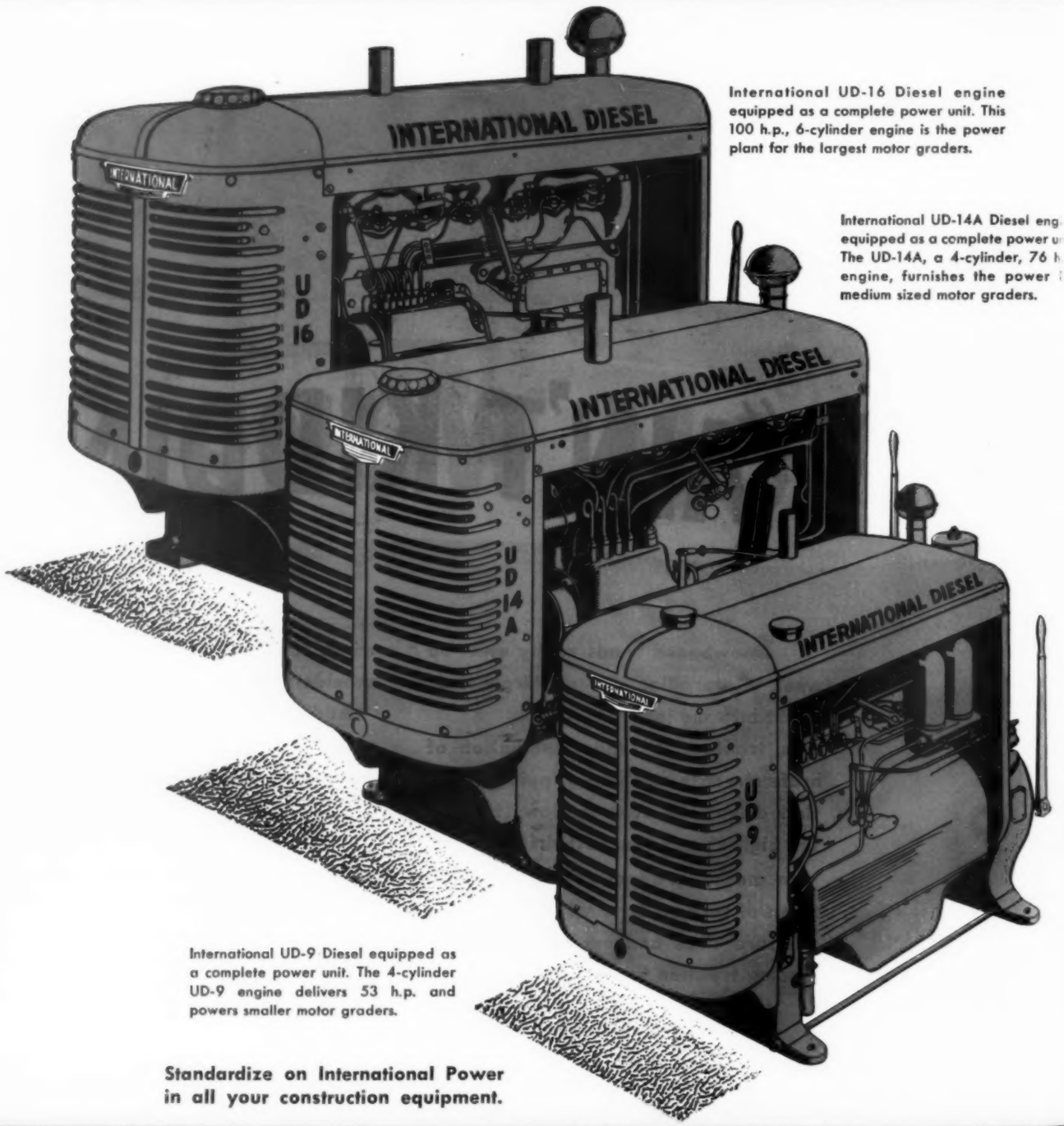
CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

INTERNATIONAL

Give You Grader Power in Your Program



International UD-16 Diesel engine equipped as a complete power unit. This 100 h.p., 6-cylinder engine is the power plant for the largest motor graders.

International UD-14A Diesel engine equipped as a complete power unit. The UD-14A, a 4-cylinder, 76 h.p. engine, furnishes the power for medium sized motor graders.

International UD-9 Diesel equipped as a complete power unit. The 4-cylinder UD-9 engine delivers 53 h.p. and powers smaller motor graders.

Standardize on International Power in all your construction equipment.

INTERNATIONAL *Industrial*

DIESELS

for Paydirt

For more work done and bigger profits in your pocket, choose motor graders powered by International Diesel engines.

International Diesels give you exclusive, in-built, gasoline-conversion starting—they start in any weather as easily as your car—to get your motor grader on the job quickly. The International Diesel fuel-injection system leads the field in advanced design. A simple, compact fuel pump with a built-in governor and torque control device gives you precision metering of fuel and instant load-grabbing ability with minimum fuel oil consumption. These and dozens of other features make International Diesels tops in productive performance.

Let your International Industrial Power Distributor show you how International Diesels add efficiency to motor grader performance and pay off in production. Here, again, you'll find International Power the essential specification in your program for paydirt.

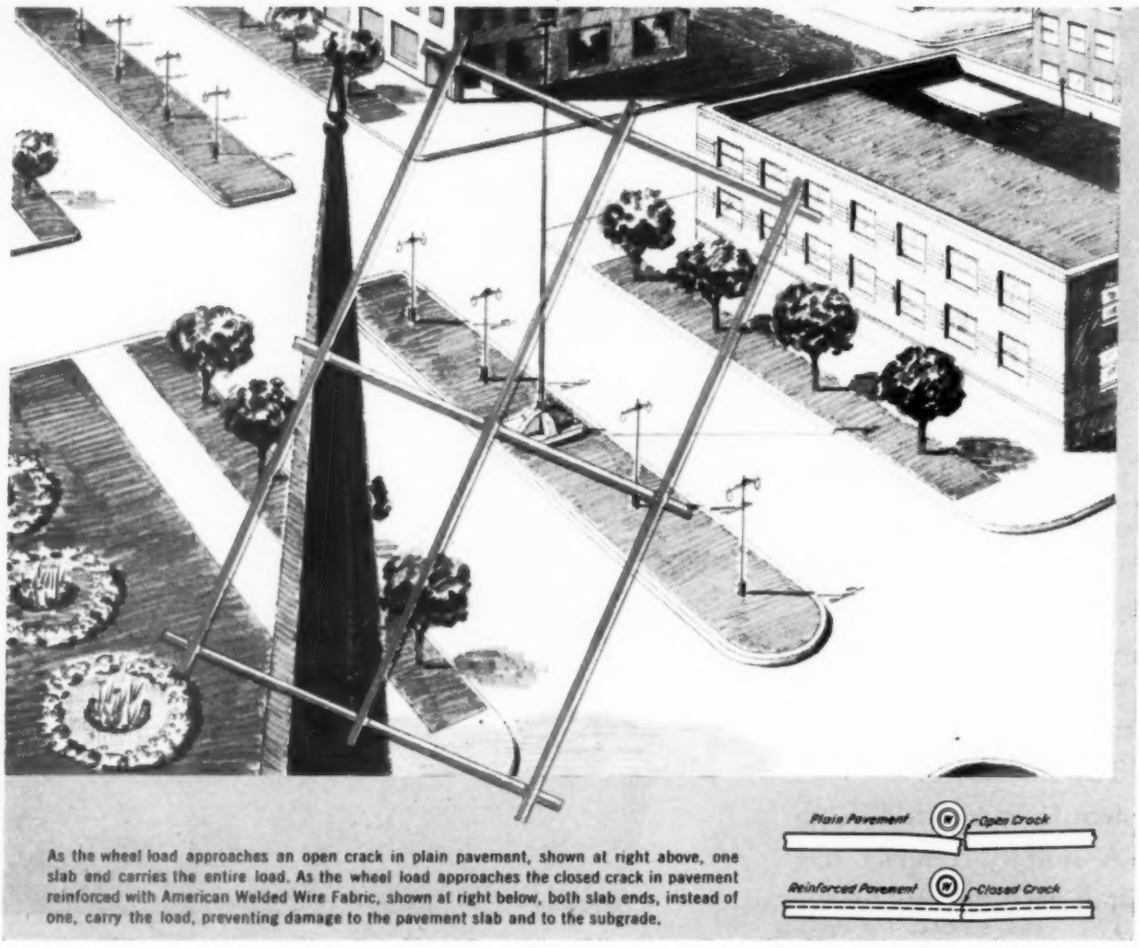
Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

Chicago 1, Illinois

INTERNATIONAL HARVESTER

Power



As the wheel load approaches an open crack in plain pavement, shown at right above, one slab end carries the entire load. As the wheel load approaches the closed crack in pavement reinforced with American Welded Wire Fabric, shown at right below, both slab ends, instead of one, carry the load, preventing damage to the pavement slab and to the subgrade.

To prolong pavement life and reduce pavement costs

buy American Welded Wire Fabric

• In the streets of many cities, American Welded Wire Fabric is widely used to reinforce concrete pavement. The many, closely spaced, small members, of cold-drawn, high yield-point steel, with rigidly welded cross wires, strengthen the entire slab. They fortify the pavement against traffic load-impact, expansion and contraction, irregularity of sub-grade and other conditions that cause cracking.

When cracks do occur, American Welded Wire Fabric prevents pumping of sub-grade, spalling, ravelling, and progressive breakage. This positive crack control reduces maintenance costs.

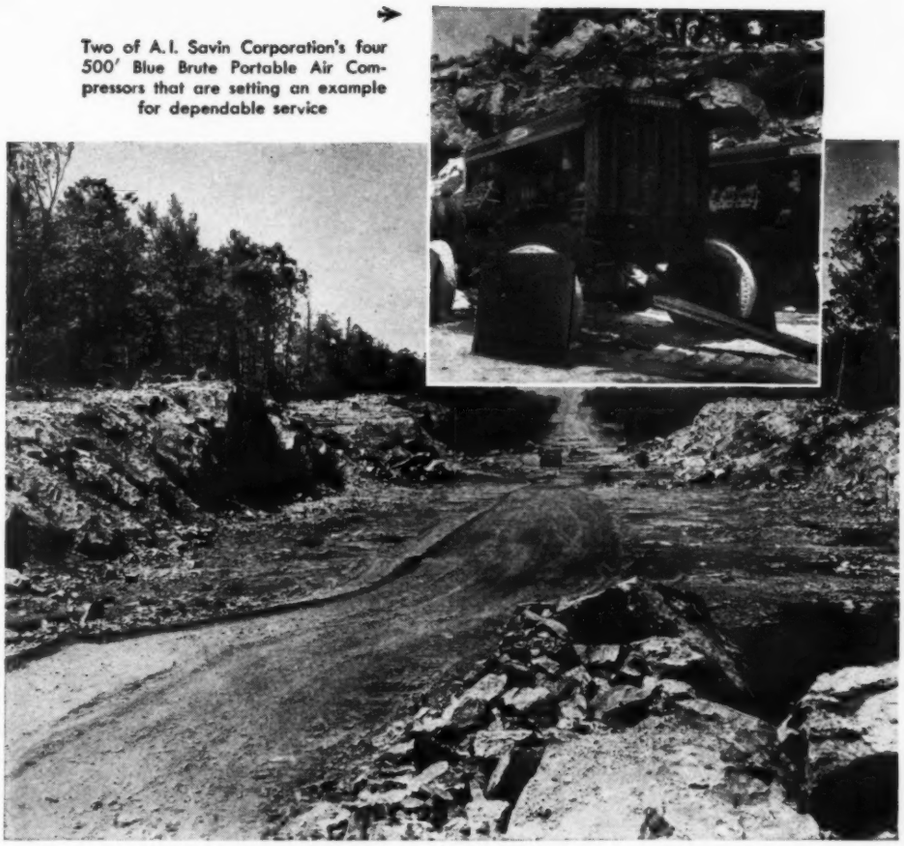
Standard styles of American Welded Wire Fabric—many of which are held in stock—are the most effective and economical reinforcement for concrete pavements. You can get specific information about the style of U·S·S American Welded Wire Reinforcement you should use, from our nearest sales office.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Every concrete paving job needs

USS **AMERICAN WELDED WIRE FABRIC** *reinforcement*

UNITED STATES STEEL



Two of A. I. Savin Corporation's four 500′ Blue Brute Portable Air Compressors that are setting an example for dependable service

TOUGH GOING!... BUT BLUE BRUTES ARE TOUGHER!

On jobs like the Boston Post Road relocation project — with rock cuts containing 70,000 yds. in a single pocket — you soon find out what your air equipment can do!

A. I. Savin reports 100% satisfaction from Worthington Blue Brutes. It's easy to see why. Blue Brute 500′ Portable Air Compressors are packed with such advanced features as full force-feed lubrication and easy-breathing Feather* Valves—the most efficient ever made. No wonder these "portable powerhouses" have stood up under long, gruelling service without an extra minute down or an extra cent spent for repairs!

Also, Blue Brute UMW-40 Wagon Drills are the most versatile in the field . . . fast, powerful drilling machines that swing into action at any angle, to make short work of the toughest rock formation!

Adding up, here's a completely dependable air supply and air tools that make the most of it . . . a typical Blue Brute team that is beating schedules the country over. For further details that prove *there's more worth in Worthington*, see your nearby Blue Brute Distributor or write us direct.

*Reg. U. S. Pat. Off.

HB-8

HERE ARE THE FACTS

The A. I. Savin Corporation is using Worthington Blue Brutes to make a fast, economical job of one of the country's most difficult stretches of highway construction — 19,500 ft. straight through rocky, coastal Connecticut terrain on the relocated Boston Post Road.

Savin's Blue Brute 500′ Portable Air Compressors feed a battery of drills, wagon and hand-held. They have supplied air almost continuously for 5,000 hours at full rated capacity — without anything but routine, after-hours servicing!

The Blue Brute UMW-40 Wagon Drills on the project match this performance with consistent drilling through 22 ft. of mixed rock in 10 to 12 minutes!

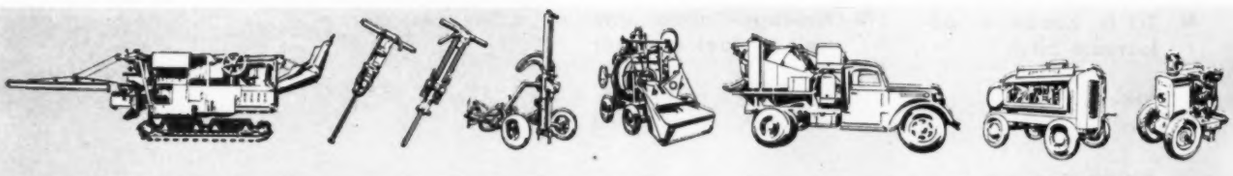
Making fast speed through mixed rock! One of A. I. Savin's UMW-40 Blue Brute Wagon Drills in action

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

Worthington-Ransome Construction Equipment Division, Holyoke, Mass. Distributors In All Principal Cities

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

Relief for Limited Budgets

This Model W-Speed Patrol handles regular maintenance and light construction for a fraction of the cost of large motor graders. Enables you to spread your upkeep dollars over more miles of roads and streets. And you get IMMEDIATE DELIVERY!

- Engine—31 brake hp.
- Weighs 5,960 lbs.
- 10 ft. blade — adjustable pitch
- Electric lights and starter
- Blade pressure 4,780 lbs.
- Short turning radius for narrow roads, streets and alleys
- Averages about one gal. of fuel an hour
- Works at 3 to 5 m.p.h. — travels up to 10 m.p.h.
- Drawbar always free

AD-4

A HEAVY-DUTY Motor Grader for HEAVY WORK

Everything You Want in a Motor Grader!

POWERFUL — 104 brake hp. . . . famous General Motors 2-Cycle Diesel Engine . . . dependable, economical, instant-starting.

HEAVY — 21,600 lbs. effective weight . . . balanced for maximum traction and control.

STRONG — exclusive tubular frame . . . absorbs shocks, protects control rods inside frame.

ACCURATE — blade held firmly on road through direct down pressure . . . cuts smoothly, within fraction of inch of desired depth.

HIGH CLEARANCE — over 30″ throat clearance for handling bigger windrows without interference.

TRAVEL SPEEDS smoothly synchronized with operator controls . . . all the needed power applied as required.

"ROLL-AWAY" MOLDBOARD — less power required to handle bigger windrows at faster speeds. Material is rolled, not pushed.

FULL CIRCLE REVOLVING BLADE — swings *ahead* of platform with plenty of end clearance.

FULL RANGE OF BLADE POSITIONS . . . plus leaning front wheels, for handling all types of grading with ease. Blade can be shifted, too, to a maximum of 40″ right or left.

ELECTRIC BRAKES — control positive, operate with less effort than auto brakes.

PLUS . . . Easier Steering, Larger Clutch, Electric Gauges, Full Visibility and many other outstanding advantages.

★ **Other Diesel-Powered Sizes**
Model AD-3.....76 brake hp.
Model BD.....50.5 brake hp.
(Same Proved Design As AD-4)

• • •

★ **Gasoline-Powered Motor Grader**
Model W-Speed Patrol
(see photo and description at left)

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

SMITH TILTERS

Famous all over the world for their fast charging, thorough "end-to-center" mixing and fast but fully controlled discharge. Ideal for central mixing plants because of low maintenance costs and rugged dependability, even when worked night and day. 4 sizes—1 to 4 yds.

SMITH-MOBILE AGITATORS

Meet all requirements such as fast loading, smooth agitating, effective mixing and HIGH discharge. Fast pouring or slow controlled discharge, as desired. No segregation. Large radius of spout distribution. 4 standard sizes.

★ If you are looking for BIGGER PROFITS from your Ready Mixed Concrete Plant, be sure to investigate both SMITH TILTERS for pre-mixing or pre-shrinking concrete and SMITH-MOBILE AGITATORS for delivering the pre-mixed or pre-shrunk concrete to the job. These modern, dependable machines are profit makers with a record of achievement that has never been equaled in the industry. They have many time saving and money saving features . . . enable you to deliver BETTER CONCRETE with speed and certainty, at low cost. Write today for descriptive literature.

FAST COMPLETE DISCHARGE

Smith-Mobiles discharge ALL the batch, whether it's high or low slump concrete. And the discharge is easily controlled. Fast when you want it fast . . . slow when you want it slow.

THE T. L. SMITH COMPANY

2862 N. 32nd STREET • MILWAUKEE 10, WISCONSIN, U. S. A.

SMITH

CONCRETE MIXER MANUFACTURERS SINCE 1900

A 5328-1P

For LaGuardia Field . . .

KEYSTONE FLASHING LIGHTS mounted on all your equipment can be seen through any snow storm. Flashing 80 warnings per minute *—to both front and rear—*they prevent accidents before they happen. Provide permanent protection for the lives of your men—the public—and your equipment.

In use all over America by states, cities, counties, towns, park and bridge commissions, public utilities, etc. on all types of vehicles. Write for sample light as the first step toward making this year the safest you have ever had.

Auto Gear & Parts Company, Inc.
16th St. & Hunting Park Ave.,
Philadelphia 40, Pa.

KEYSTONE *FLASHING* LIGHT

Specially designed, heavy-duty light for highway use. Vibration proof—water and dust tight. Can be mounted anywhere on the vehicle and is supplied with 6½ inch red lenses lettered "STOP" or with plain red, amber or blue lenses, for 6 and 12 volt systems.

Lost Highways...

....Quickly Reclaimed

...with the dual rotors of the BROS *Sno-Flyr*

Picture the consequences of snow-bound highways—disrupted communications, threatened sanitation, blocked farm-to-market deliveries, endangered lives.

The cost of such paralysis is incalculable. But the cost of removing the snow *can* be figured. And in the days when fleets of snow removal equipment and armies of men were the only defense against winter's threat, that cost was tremendous.

Today, however, men responsible for highway maintenance find a vastly different picture when they discover the speed and economy of a *Bros* Sno-Flyr... the modern rotary that removes snow at lower cost.

They find that the *Bros* Sno-Flyr can keep their roads open and traffic moving at all times. Dual rotors, hydraulically controlled feeder rake, double-V mold board design and either a 170 or 275 h.p. motor provide the *Bros* Sno-Flyr with extraordinary speed and power. The Sno-Flyr moves quickly into the toughest snow banks and leaves a wide, clean cut without dangerous banks.

If you're looking for the quick, economical method of digging out lost highways or cleaning snow-coated roads and streets, write us for specifications and literature on the *Bros* Sno-Flyr—World's Fastest and Most Powerful Truck Rotary.

WM. BROS BOILER AND MANUFACTURING COMPANY, Minneapolis 14, Minnesota

EXPORT DIVISION: KNICKERBOCKER EXPORT CO., 50 Broad Street, NEW YORK 4, N. Y.
CABLE ADDRESS: "KNICKMIXER"

BROS *Sno-Flyr*

THE WORLD'S FASTEST, MOST POWERFUL ROTARY SNOW PLOW

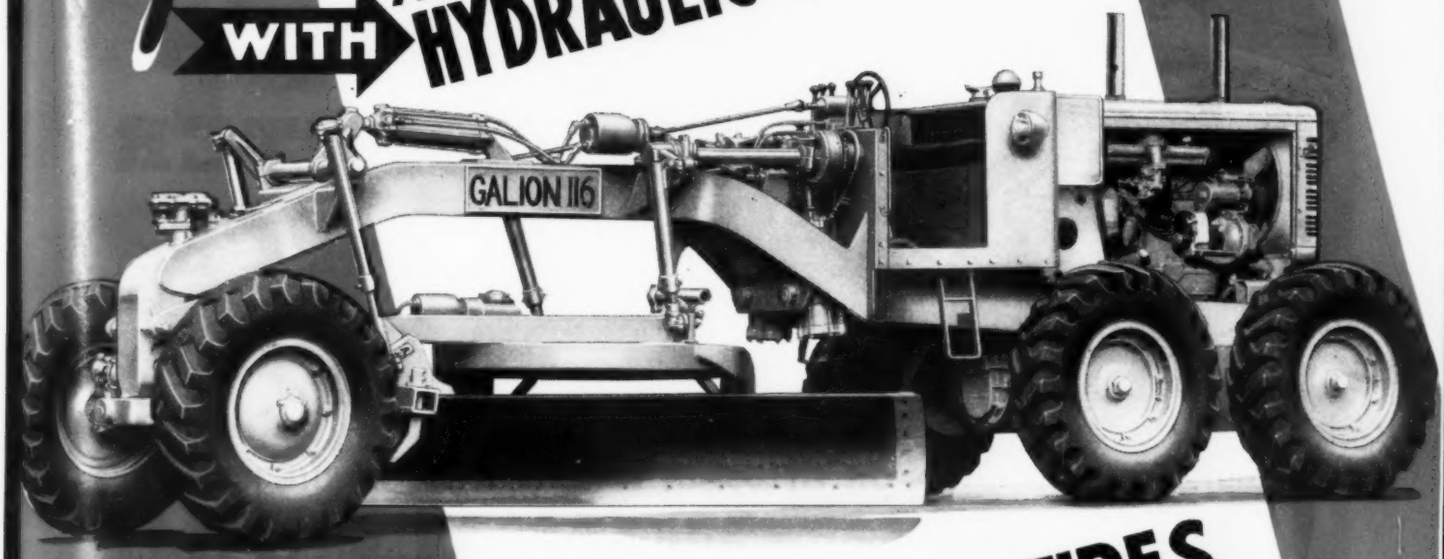
STANDARD EQUIPMENT *includes*—

No. 116
100 h. p. for extra heavy-duty service

No. 103
76 h. p. for heavy-duty service

No. 202
50 h. p. for medium-duty service

WITH *Manual Steering* HYDRAULIC BOOSTER



COMBINATION MANUAL AND HYDRAULIC STEERING

This standard equipment assures:

- Easier steering — less work for an operator.
- Less operator's fatigue — more work accomplished.
- More weight on front wheels — better balance.

LOW-PRESSURE TIRES

This standard equipment assures:

- More ground contact — gives greater stability for all operations.
- Less front end slippage on bank or shoulder work.
- Better flotation on soft material.
- Less shock and wear on machine and operator.
- Economy and convenience of a single tire size.
- Permits faster traveling speeds.

AND SAME SIZE TIRES *Front and Rear*

FOR SUPERIOR PERFORMANCE

Every feature necessary for top performance is included as *STANDARD EQUIPMENT* on GALION Motor Graders. The hydraulic booster used in combination with manual steering is a *performance booster*. It provides the "feel" of hand steering with the "ease" of power steering —a combination that makes contented operators.

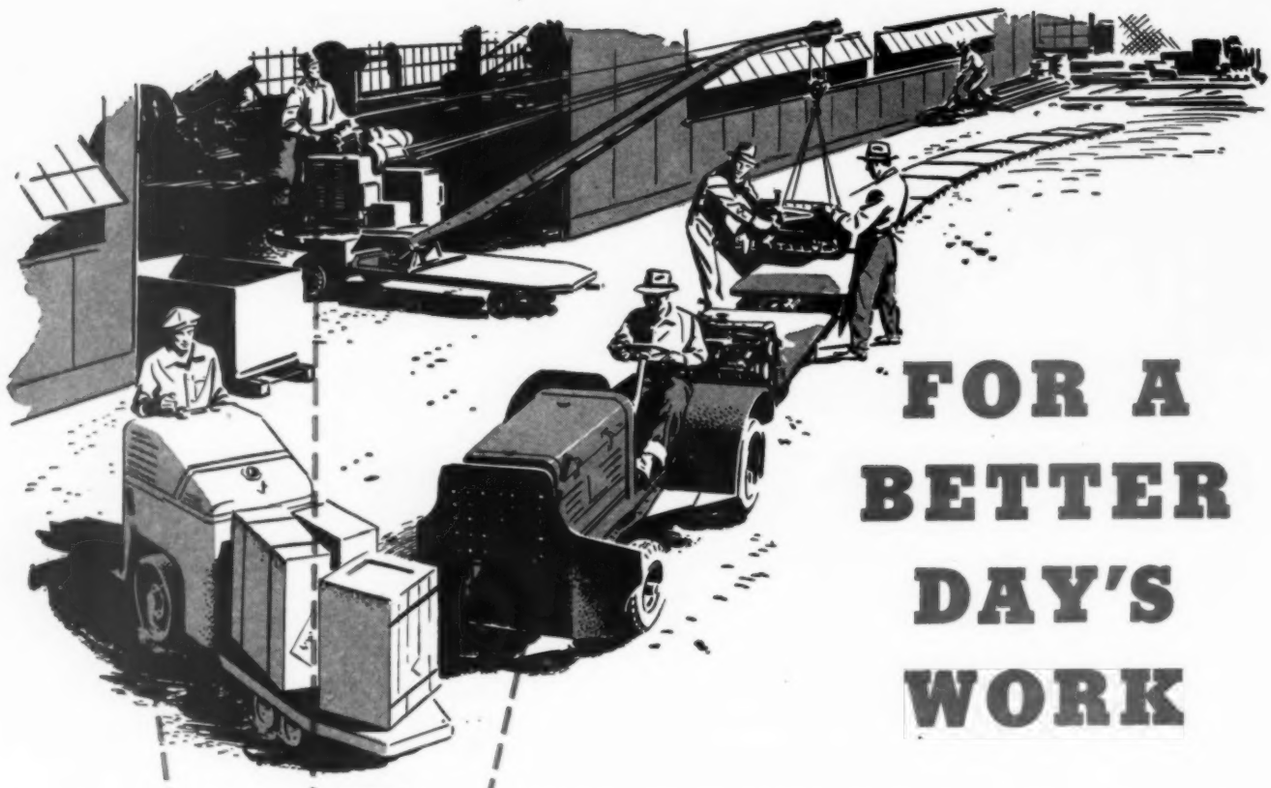
Operators also like the large, ground-grip, low pressure tires — same size, front and rear. These massive tires give utmost stability and traction, and keep side draft to a minimum.

And because operators can do better work with GALION Motor Graders, it pays you to buy and specify "GALION." Write for catalog and name of nearest Distributor.

THE GALION IRON WORKS & MFG. CO.
General and Export Offices
Galion, Ohio, U. S. A.
Cable Address: **GALIONIRON, Galion, Ohio**

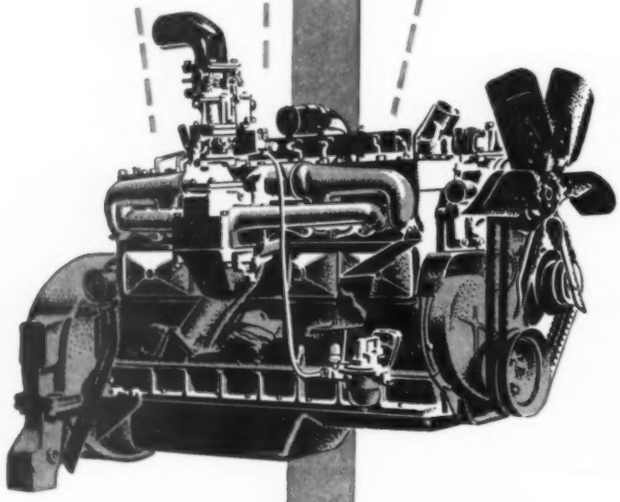
GALION
Estab. 1907

GRADERS • ROLLERS



FOR A BETTER DAY'S WORK

IN INDUSTRY—ON FARMS—IN OIL FIELDS—IN FORESTS AND ON THE HIGHWAYS!



● The job of keeping America's production lines rolling calls for power that knows no quitting time . . . power that serves *every* shift efficiently and economically. That's why you'll find Chrysler Industrial Engines and Power Units serving American industry in cranes, lift trucks, tow trucks, pumps, air compressors and arc welders. The manufacturers of industrial equipment know that each Chrysler Industrial Engine is the result of the engineering and production skill of Chrysler Corporation. They know from experience that Chrysler Industrial Engines are built to deliver A Better Day's Work!

NATION-WIDE SERVICE

FACTORY - ENGINEERED AND TESTED PARTS WITH EXPERT MAINTENANCE WHEREVER YOU ARE

CHRYSLER

INDUSTRIAL ENGINES

HORSEPOWER WITH A PEDIGREE

INDUSTRIAL ENGINE DIVISION, CHRYSLER CORP., 12200 E. JEFFERSON, DETROIT 31, MICH.

Keep Traffic on the Go!

Be SURE with a Baker

You can avoid troublesome traffic tie-ups this winter with powerful Baker truck plows on the job. Light in weight, but dependable, durable and sturdily constructed Baker truck plows are built to solve snow problems speedily — effectively — efficiently. Specially designed curved moldboards lift and roll drifts away using a minimum of truck or tractor power. Sectional tripping blades — keep pavements clean — provide positive protection from damage to either truck or plow. Permits high speed plowing with complete safety to operator. Whether your needs are big or small there are Baker V type, one way or reversible plows for *every* requirement. Investigate today!

BAKER MFG. CO., Springfield, Illinois

BAKER

TRUCK - TRACTOR - GRADER PLOWS SINCE 1908

Baker V Plow and Allis-Chalmers tractor slicing through and widening deeply drifted highway.

Baker Plow on Allis-Chalmers wheel tractor cleaning roadway and walks.

Fast DUMPTOR MAKES MONEY

Here are other KOEHRING HEAVY-DUTY UNITS that will SAVE MONEY ON YOUR ROADBUILDING:

½-YD., ¾-YD., 1½-YD. SHOVELS

for low-cost, high-production excavation in heavy cuts or rock.

CLAMSHELL CRANES

for stockpiling aggregates . . . feeding cement batch plants.

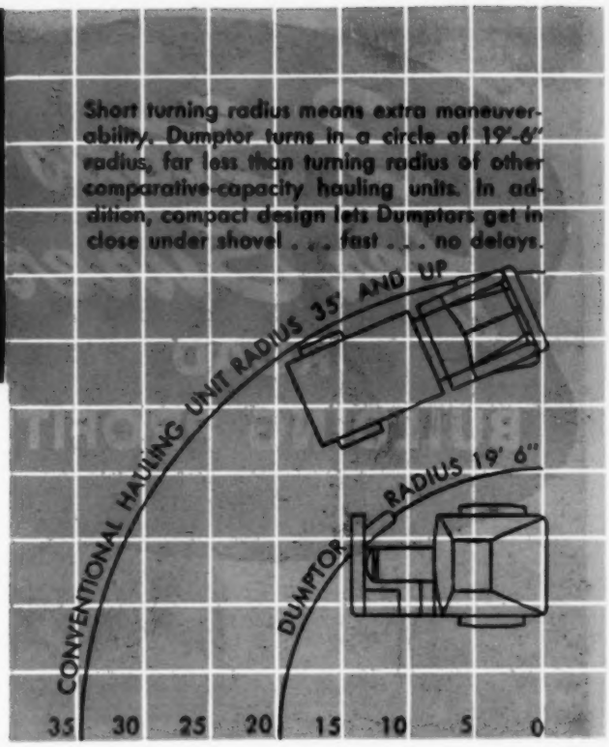
TWINBATCH PAVER

for more batches mixed per hour . . . more concrete laid per shift.

LONGITUDINAL FINISHER

for accurate surfaces finished fast, at low cost and as specified.

spotting
2 WAYS

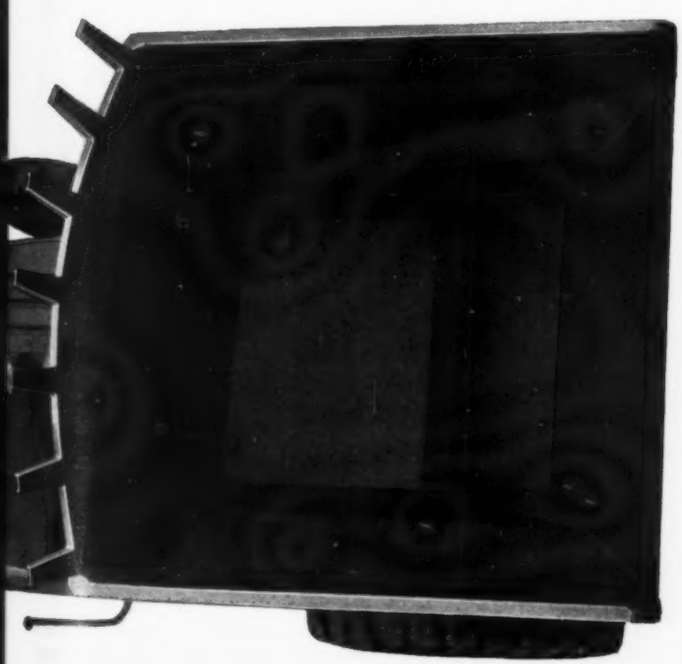

Short turning radius means extra maneuverability. Dumptor turns in a circle of 19'-6" radius, far less than turning radius of other comparative-capacity hauling units. In addition, compact design lets Dumptors get in close under shovel . . . fast . . . no delays.
CONVENTIONAL HAULING UNIT RADIUS 35 AND UP
DUMPTOR RADIUS 19' 6"
35 30 25 20 15 10 5 0

1 MORE LOADS PER HAUL UNIT

Koehring Dumptors save slow jockeying back and forth at the shovel. Wheel base is only 102". You can turn in circle of 19'-6" radius, far less than turning radius of other hauling units of comparative capacity. That means extra maneuverability to get spotted fast and accurately without help. Driver always faces load, can see all around. Every second saved in the cut means extra haul-time, less shovel delay . . . more loads delivered.

2 MORE PRODUCTION BY SHOVEL

Big, 64 square-foot body opening speeds shovel loading. Here's a big target your operator can hit fast and easy. Because of compact design, Dumptors can get in closer than more cumbersome units . . . makes it easy to keep shovel swing short. Reducing swing-time only 10 to 15% can increase your shovel production average as much as 5%.



Dumptors give you many other time and money-saving advantages: big tires, high ratio of horsepower to weight, mean fast haul over any kind of construction road . . . 3-speed travel, both forward and reverse, gives you no-turn shuttle haul . . . 1-second gravity dump saves you 15 to 25 seconds every dump . . . rugged, heavy-duty construction gives you less down time, more work-time. Ask your Koehring distributor to show you what Dumptors can do on your roadwork and any other "off-the-highway" dirt moving jobs.

This is what shovel operator sees when he's loading Dumptors. Body flares out to big 8' x 8' top, is easy to load. You can keep shovel swing short, because Dumptor gets in close . . . square-shaped body permits loading over side or end . . . fast spot . . . quick get-away.

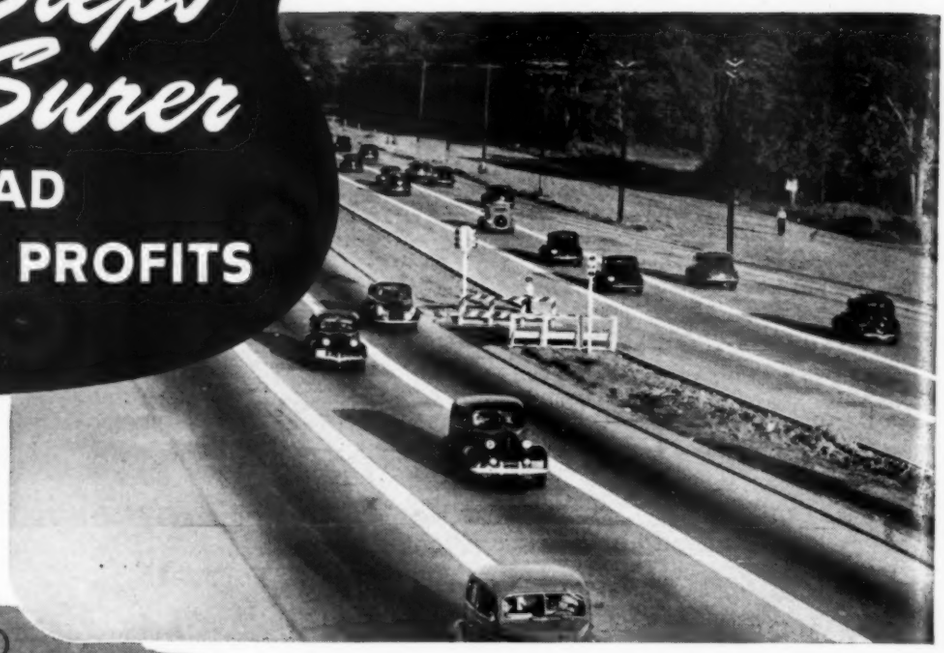
KOEHRING HEAVY DUTY

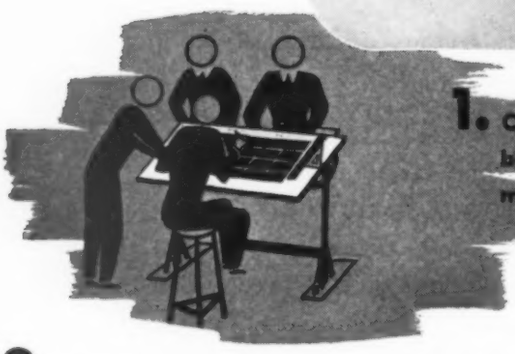
KOEHRING COMPANY, Milwaukee 10, Wis.

Subsidiaries: JOHNSON • PARSONS • KWIK-MIX

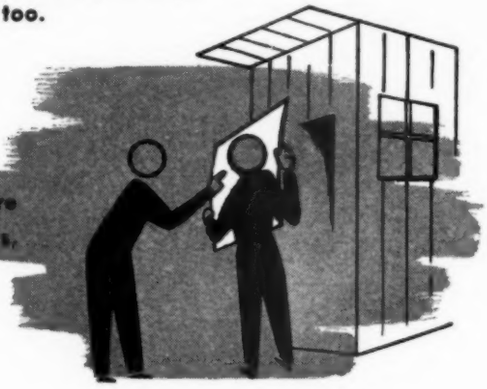
DUMPTOR, TWINSATCH — Trademarks Reg. U. S. Pat. Off. K808

3 Steps for Surer ROAD BUILDING PROFITS

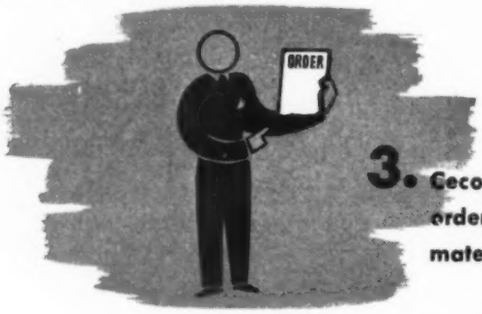




1. Ceco's pre-bidding data takes the guess-work out of bidding, so you can bid to get the job—make money on it, too.



2. Ceco's material data lets you forget detail work—you are supplied with blue prints on reinforcing and other materials, making the job much easier.



3. Ceco streamlines road building for you. In one complete order you can specify everything you need. You get materials when you want them, where you want them.

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5601 West 26th Street, Chicago 50, Illinois

CECO STEEL

TYPICAL CECO HIGHWAY PRODUCTS • Welded Wire Fabric • Metal Center Strips
Cecure Curing Compound • Reinforcing Steel • Load Transfer Devices • Joint Sealing Compound
Dowel Bar Supports and Sockets • Stake Pins • Expansion Joints • Sub-Grade Paper

In construction products **CECO ENGINEERING** *makes the big difference*

Team up two Oliver "Cletrac" crawler tractors with a bulldozer and front-end loader and you've got a winning combination that really pays off in fast, low-cost dirt moving.

With the exclusive Oliver "Cletrac" steering principle, the tractor-dozer unit cuts your clearing time to the minimum. There's always power on both tracks for biggest load-handling ability. You can speed up one track, slow down the other to offset the side pull of an off-center load. Time-wasting, power-wasting jackknifing is eliminated. And with constant two-track power, operation on hills and slopes is safer.

Oliver "Cletrac" steering lightens the load of front-end loaders, too. There is no undue strain of tractor frames or steering mechanisms. This Oliver "Cletrac" loader is a fast-acting unit that really makes dirt fly! Controlled "tip-up" bucket prevents spillage of loose material. And, since there's no excess weight on the front of the tractor, lifting capacity is materially increased.

Why not have your Oliver "Cletrac" dealer show you how this hard-working "team" can speed your jobs?

"THE SIGN OF EXTRA SERVICE"

OLIVER Cletrac SALES SERVICE

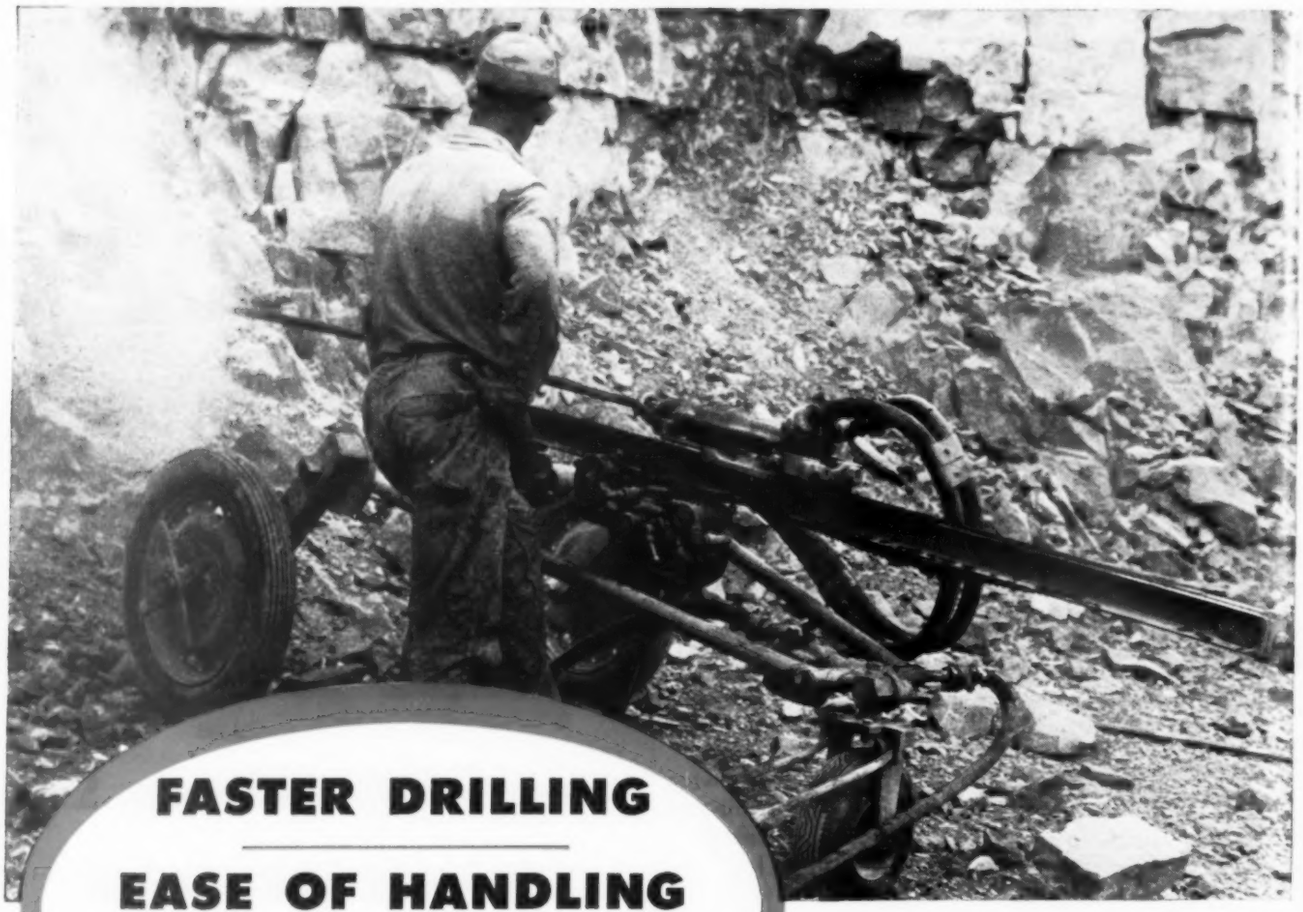
Cletrac

a product of

The OLIVER Corporation

INDUSTRIAL DIVISION: 19300 EUCLID AVENUE, CLEVELAND 17, OHIO

JOY ONE-MAN LIGHTWEIGHT WAGON DRILL



FASTER DRILLING

EASE OF HANDLING

LOW MAINTENANCE

You'll get *more hole* per shift, at lower costs, with the *exclusive* "drill and blow" feature of the JOY Lightweight Wagon Drill. And it's really lightweight—only 750 lbs.—easily operated by one man. Mounts JOY 55 or 65-pound sinkers, and 3" or 3½" drifters, as needed . . . requires no spikes due to the positive locked brakes. JOY pioneered the Lightweight eight years ago—more than 500 now in operation. It can save you time and money—*write for bulletin.*

Above, drilling toe-holes—no need to stop drilling to blow. Piston speed and blow automatically adjusted to give fast, consistent and economical drilling in every kind of formation—especially in overburden, clay seams and other material that varies from hard to soft.

W&D C 2011

Consult a Joy Engineer

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY-SULLIVAN OF CANADA, LIMITED, GALT, ONTARIO

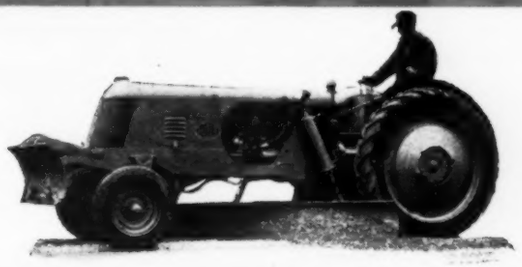
UP GOES EFFICIENCY! DOWN COME COSTS!

WHEN YOU PUT MODERN HUBER ROAD MACHINERY TO WORK...

Huber's close contact with the users of road machinery reflects itself in the modern design, functional utility, and economical operation of Huber road machinery. The ability of Huber machinery to do your job adds greatly to the efficiency of your road building or maintenance operation.

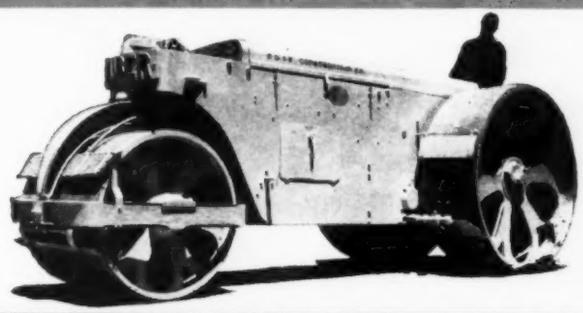
Added to Huber's "job-ability" is their fine record for long trouble-free service – a point that really counts when it comes to cutting costs. Idle equipment is expensive equipment. With Huber your "downtime" will decrease regardless of your operating conditions.

You'll be falling right in line with hundreds of experienced operators if you replace your present equipment with Huber road machinery. Where is there better proof of the many advantages of doing your job the Huber way than in this nationwide acceptance of Huber machinery? Write today for bulletins describing specific Huber machines.



Turn the Huber Maintainer loose on any maintenance work. It's a real money-saver as a bulldozer, lift loader, beam leveler, patch roller, snow plow or rotary broom.

Take the Huber Tandem wherever you need a variety of compacting and rolling weights. Variable weight sizes from 3 to 14 tons.



For years of service the Huber 3-Wheel Roller is unsurpassed. They're rugged built in sizes from 5 to 12 tons.

THE HUBER MFG. COMPANY ● MARION, OHIO, U. S. A.

HUBER

3 Wheel ● Tandem

ROAD ROLLERS *and* MAINTAINERS

For over
20
years . . . a preferred source of asphalt
"That's right...and Ohio Oil's asphalt production will be bigger than ever in '49"*
The OHIO OIL Company

CHECK OFF ANOTHER REASON WHY OHIO OIL CAN MAKE FLEXIBLE, ON-TIME DELIVERIES . . . WITH DAILY ADJUSTMENT OF SCHEDULE TO MEET LOCAL JOB CONDITIONS

- **A major asphalt producer for over 20 years . . . with greatly increased refinery facilities in '49, as a result of Ohio Oil's big expansion program.**
- **Ample crude supply.** (Ohio Oil owns and produces all of its own crude — assuring first choice of best asphaltic crudes.)
- **Ample storage facilities** for all types and grades of asphalts (increased for '49) to assure immediate shipments and to meet peak demands.
- **Ample loading facilities** for tank cars — also increased for '49.
- **Large reserve of tank cars** in all sizes.
- **One company control.** All operations under direct refinery control of The Ohio Oil Company.
- **Top Engineering Service, too.** You get reliable recommendations, based on exhaustive field and laboratory studies, to make sure you get the right type of asphalt for local aggregate and other conditions.

Ohio Oil serves this 15-state area

Contact nearest office or state representative for all grades of asphalt and asphalt cements.

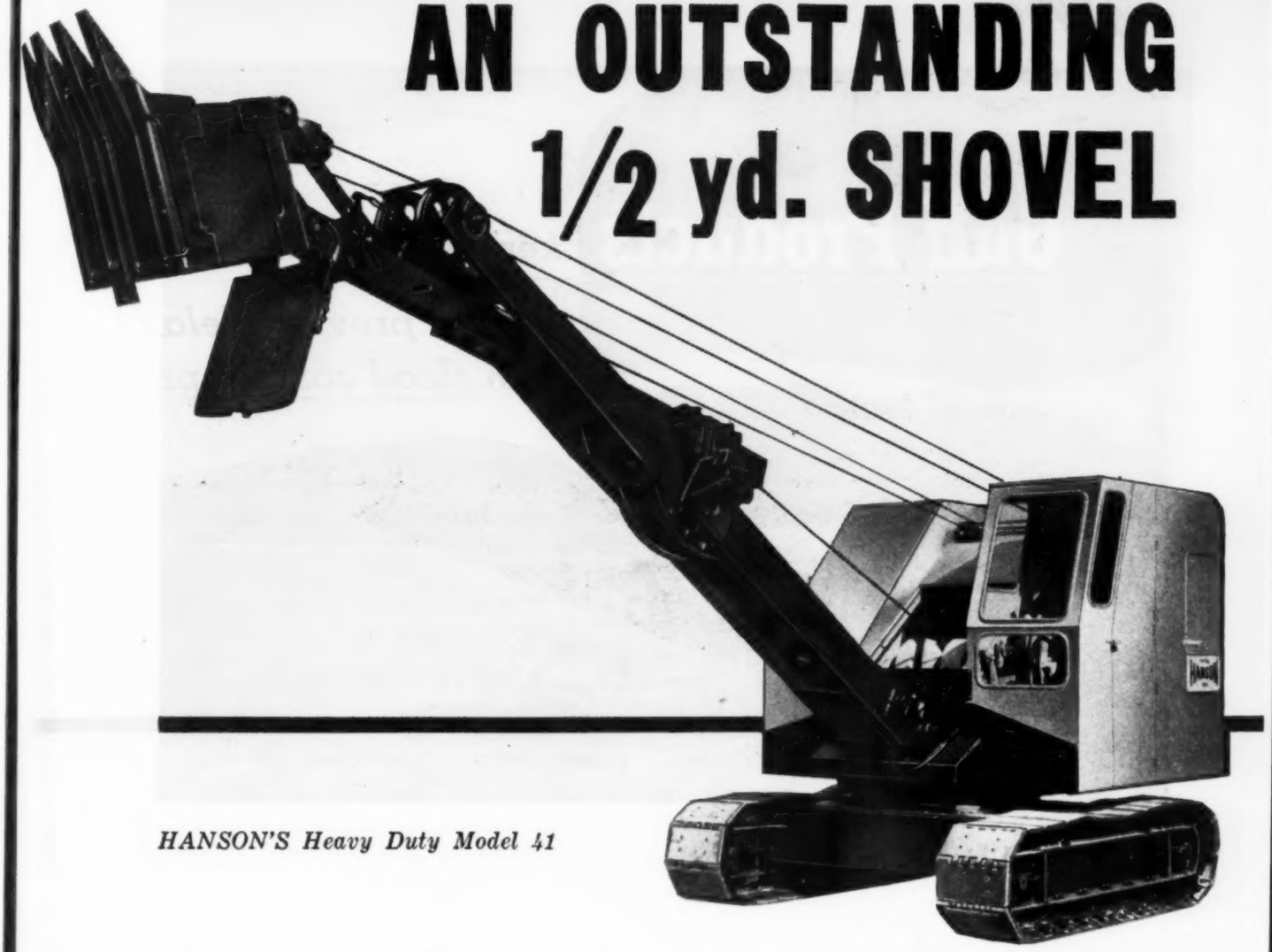
The OHIO OIL Company

Asphalt Department

MARATHON

ROBINSON, ILLINOIS • LOVELL, WYOMING • Producers of petroleum since 1887

AN OUTSTANDING 1/2 yd. SHOVEL



HANSON'S Heavy Duty Model 41

When we say "outstanding" we mean just that. Unless you've seen it eat into a hillside or talked to the man who pulls the levers in the HANSON cab, you might be skeptical too. He'll tell you that the unit seems **always** to have something in reserve—that there's a margin of **extra power** which puts a confident smile on his face and adds to his feeling of comfort and safety. There's less fatigue and more work done with a HANSON!

These are some of the features which combine to make the HANSON outstanding:

Full revolving Chain crowd Fully enclosed steel cab Welded steel construction Ball or roller bearings at all vital points Air controlled steering Two-speed transmission Disc type clutches on swing Internal expansion, booster type clutches on hoist and crowd All clutches easily and quickly relined or adjusted without removing shaft assemblies Extra long crawlers Heavy duty industrial type motor—gasoline or diesel.

CLUTCHES ARE IMPORTANT

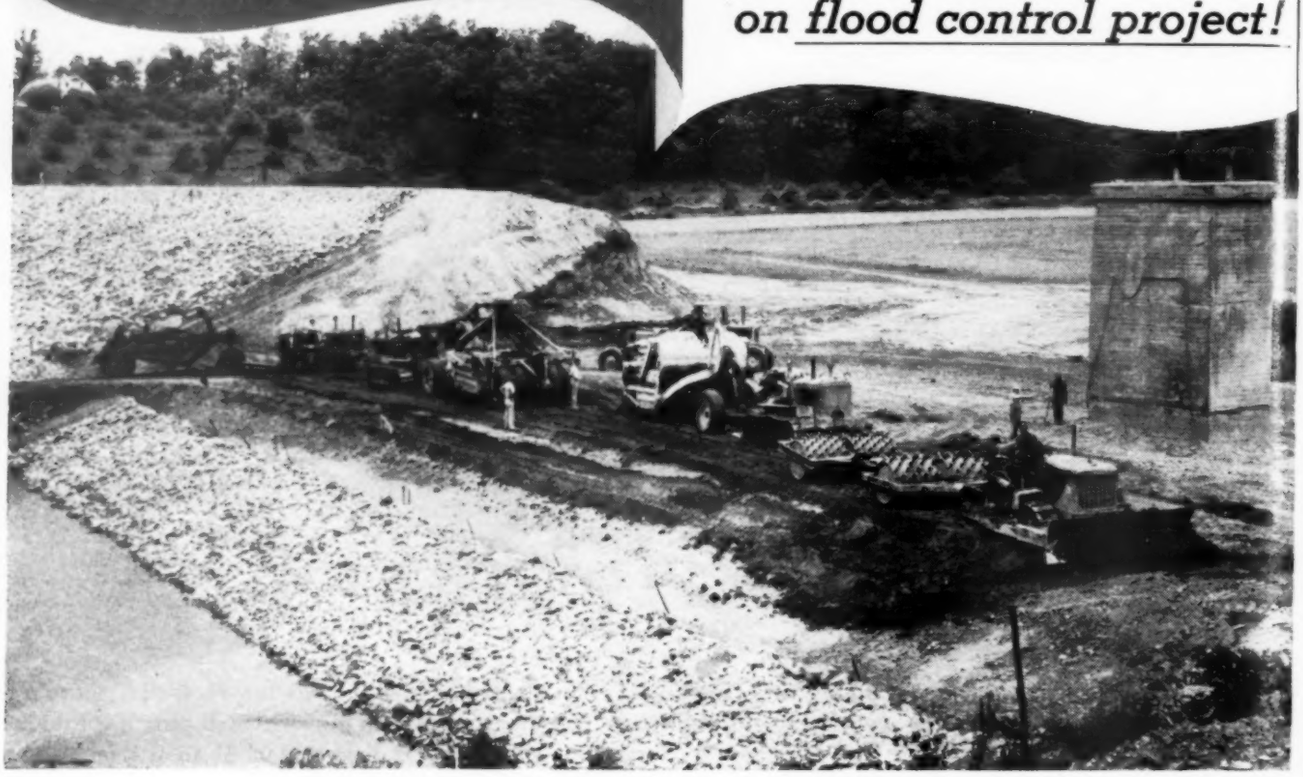
On a HANSON shovel the clutches can be adjusted or relined without removing the shaft assemblies. Time saving and money saving!! You can expect the best in clutch design from a company that began business as a manufacturer of clutches.

HANSON

CLUTCH AND MACHINERY CO., TIFFIN, OHIO

Gulf Products keep equipment rolling . . .

help prevent delays on flood control project!



John F. Casey Co., Pittsburgh, Pa., has the contract for this important flood control project at Elkins, W. Va. Two earth dams and a connecting canal are being built to divert from Elkins the flood waters of the Tygart River, the course of which takes the form of a hairpin in the city. Pictured here, in the finishing stage, is the diversion dam, upstream from Elkins. Of earth construction, it is compacted and slope faced with crushed rock.

"All-weather protection with Gulf quality lubricants and smooth power with Gulf fuels are playing a big part in our fast progress on this earth dam job," says H. G. Cranston of John F. Casey Co. "In spite of the widely varying operating conditions we have encountered, our equipment has made an outstanding efficiency record."

The rate of progress and the profit on any engineering or construction job depend to a large extent on equipment performance. That is why many leading contractors specify Gulf lubricants and fuels — they know that with these quality Gulf products they can always rely on extra hours of trouble-free service from every unit.

GULF

Gulf Oil Corporation • Gulf Refining Company

Division Sales Offices:
Boston • New York • Philadelphia • Pittsburgh • Atlanta
New Orleans • Houston • Louisville • Toledo

UNDER CONTROL

. . . of BLACKHAWK *Hydraulics!*

THE MEN who build plows and the men who use 'em — know the ease, speed and accuracy with which Blackhawk Hydraulic Controls lift and lower the blades. That's why nine out of ten snow plow manufacturers build with Blackhawk as standard equipment. When drifts are high and the going is tough, road men appreciate the dependable performance and extra security they get from Blackhawk Hydraulic Systems operated from the comfort of a warm cab. You'll be ordering known performance and satisfaction when you specify Blackhawk Hydraulics on *all* your road equipment. For complete information on the advantages of Blackhawk Hydraulics, write to your equipment manufacturer.

To Equipment Manufacturers:

Blackhawk Hydraulic Controls are engineered and priced for *quantity purchase* and *practical* installation on your products for even greater customer satisfaction. Submit your hydraulic problems to us. We will work with you in confidence.

*POWER-DRIVEN P-104 Power-Packer Pump—belt or gear driven—control valve is operated from cab. Compact, easily installed.

*HAND OPERATED P-60 Power-Packer Pump—mounts in cab. Blackhawk is also the source for RAMS and VALVES for use with these pumps.

*Trade-mark registered U.S. Patent Office.

A Product of **BLACKHAWK MFG. CO.,** Dept. RS, **Milwaukee 1, Wisconsin**

BLACKHAWK *Hydraulic* **EQUIPMENT**

Road Building Equipment KEEPS *On the Move*

WITH WHITNEY CHAINS

Whitney Chains will keep your road building equipment moving by giving dependable, long-lived performance under the toughest construction conditions. Precision built of heat-treated, alloy steel parts, they can be relied on to deliver full horsepower and *withstand shocks and overloads in rough continuous service.* Because they are tough and give long wear, Whitney Chains will help to keep your equipment working and reduce maintenance headaches. It will *pay you* to use Whitney Chains on your road building equipment. Write for information and specifications.

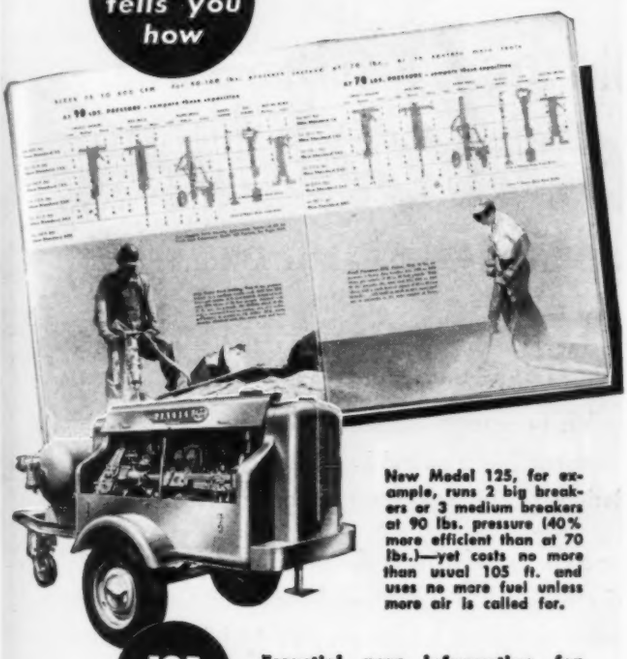
WHITNEY CHAIN & Mfg. Co.

Division of Whitney-Hanson Industries, Inc.

216 Hamilton Street, Hartford 2, Connecticut

tools do 30%–40% more work with new size Jaeger compressors

this book tells you how



New Model 125, for example, runs 2 big breakers or 3 medium breakers at 90 lbs. pressure (40% more efficient than at 70 lbs.)—yet costs no more than usual 105 ft. and uses no more fuel unless more air is called for.

125 cfm

75 cfm

185 cfm

250 cfm

365 cfm

600 cfm

Essential new information for every user of compressed air . . .

shows you why Jaeger has increased compressor sizes to match the greater requirements of today's air tools . . .

shows you how many more of every type of air tool you can now operate with these "new standard" compressors . . .

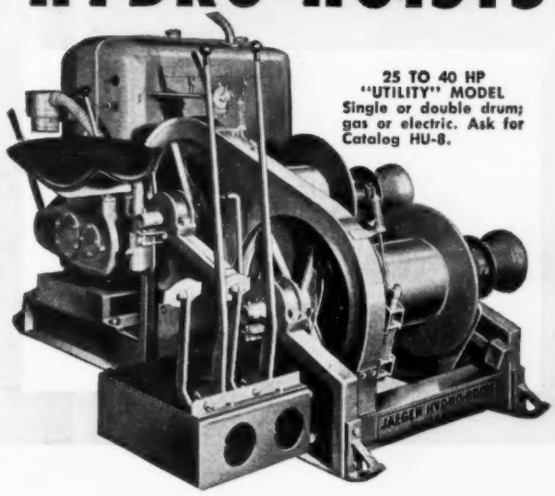
shows you why "full pressure" operation results in 30% to 40% more work with the same men and tools . . .

shows you the complete new line of Jaeger "AIR PLUS" Portable and Stationary units that give you more air but cost no more.

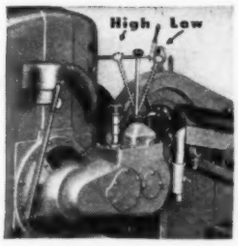
See your Jaeger distributor or send for this new buyer's guide today. Specify Catalog JC-8.

speed your work, cut costs with

JAEGER TWO-SPEED HYDRO-HOISTS



25 TO 40 HP "UTILITY" MODEL Single or double drum; gas or electric. Ask for Catalog HU-8.

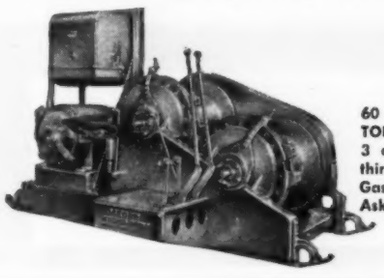


2-SPEED AUTOMOTIVE TRANSMISSION: Just shift a lever from powerful "Low Gear" to fast "High Gear" to increase line speed with your lighter loads. Change power quickly; transmission has 1800 rpm input speed for gas or diesel engines or for direct drive from standard squirrel cage motor.

HYDRAULIC FINGER-TIP CONTROL: Just like $25,000 cranes! Operator "feels" his load perfectly but never has to fight its weight. He handles the work faster, places loads more accurately, sets your whole job a fast, cost-cutting pace.

Hydraulic clutches are instant releasing, have only one simple adjustment. Hydraulic brakes are air-cooled; linings last twice as long.

ALL-STEEL, BOX-TYPE CONSTRUCTION: No more broken side frames or drum flanges. Self-aligning bearing blocks, advanced engineering thruout.



60 TO 100 HP "ERECTORS" MODEL: Up to 3 drums or can add third drum in field. Gas, diesel, electric. Ask for Catalog HE-8.

THE JAEGER MACHINE COMPANY

Columbus 16, Ohio — Distributors in 130 Cities

REGIONAL OFFICES:	1504 Widener Bldg. PHILADELPHIA 7, PA.	226 N. LaSalle St. CHICAGO 1, ILL.	235 American Life Bldg. BIRMINGHAM 1, ALA.

34 YEARS Market Street
Savannah, Mo.

29 YEARS East Bridge Street
Oswego, N. Y.

27 YEARS Main Street
Cape Girardeau, Mo.

20 YEARS First Street
Aberdeen, Wash.

Old Streets Resurfaced with CONCRETE

Stand the Test of Time and Traffic

Resurfacing with concrete is a practical way to make durable new pavements of old worn surfaces. This renovation is economical and quickly achieved if the old pavement has a sound base that can be used as a foundation for the new concrete topping.

Concrete resurfacing is also the answer to the problem of strengthening old thin-slab pavements that are no longer adequate for present or anticipated traffic loads. These old, thin slabs often need widening, too. Both jobs can be done simultaneously—at a saving of time, money and inconvenience.

Streets resurfaced with concrete are smooth-riding, strong, durable and economical. Hundreds, like the few shown at the left, have given highly satisfactory service for twenty or thirty years and more. Such streets have all the advantages of new concrete pavements: uniformly high skid resistance, wet or dry; low maintenance cost; greater safety at night due to concrete's light reflectance—highest of all pavement surfaces.

Write today for a free copy of a new illustrated bulletin, "*Concrete Resurfacing for Old Pavements*," which describes many resurfacing projects and contains valuable design data. This booklet is distributed only in the United States and Canada.

PORTLAND CEMENT ASSOCIATION

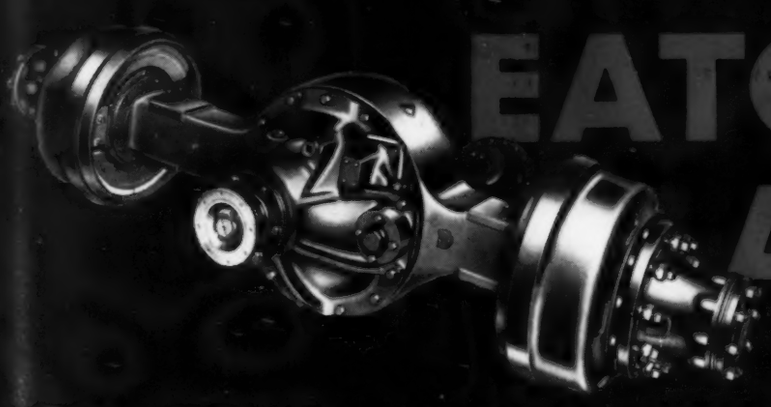
Dept. 10-28, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

The Eaton Planetary System Minimizes the Load on Each Gear Tooth with Resultant Longer Life

In Eaton's exclusive planetary system, the gear load is divided over four planetary pinions. Hence, the pound load per inch of gear tooth face is relatively low, and possibility of fracture under severe service conditions is minimized. This feature contributes to the long life of Eaton 2-Speed Axles.

See your truck dealer for complete information.



EATON *2-Speed Truck* AXLES

POWER WHEN YOU NEED IT—SPEED WHEN YOU WANT IT

EATON MANUFACTURING COMPANY

Axle Division

CLEVELAND, OHIO

PRACTICAL BOOKS for PRACTICAL MEN

Books for Engineers and Contractors written by men who have had actual experience as contractors and engineers.

ROAD AND STREET CONSTRUCTION METHODS AND COST

By Halbert P. Gillette and John C. Black
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Records of actual costs and methods of construction on street and highway work. Fully indexed. Approx. 600 pages—$6.00 plus postage.

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By V. J. Brown, *Assoc. Mem. ASCE, Director, Caminos y Calles*
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U. S. Public Roads Adm.

A word or phrase in one branch of engineering may have an entirely different meaning in some other branch. This book is offered as a step toward avoiding misunderstanding between the different branches of engineering, the public and other professions. It is arranged in dictionary form. Appendices include foreign language terms; symbols; abbreviations; weights and measures; conversion factors. 439 pages—$4.00 plus postage.

SOIL STABILIZATION

By V. J. Brown; C. A. Hogentogler, senior and junior; Frank H. Newman, Jr., C. M. Lancaster and E. S. Barber.

Compiled from a series of articles written for Roads and Streets magazine by a group of well-known highway engineers, it contains the elementary principles of soil mechanics and soil stabilization. The demand for this book has been world wide. It is a vital need for the engineer considering low cost road improvement or grading embankment control. Profusely illustrated — 141 pages — $2.00 plus postage.

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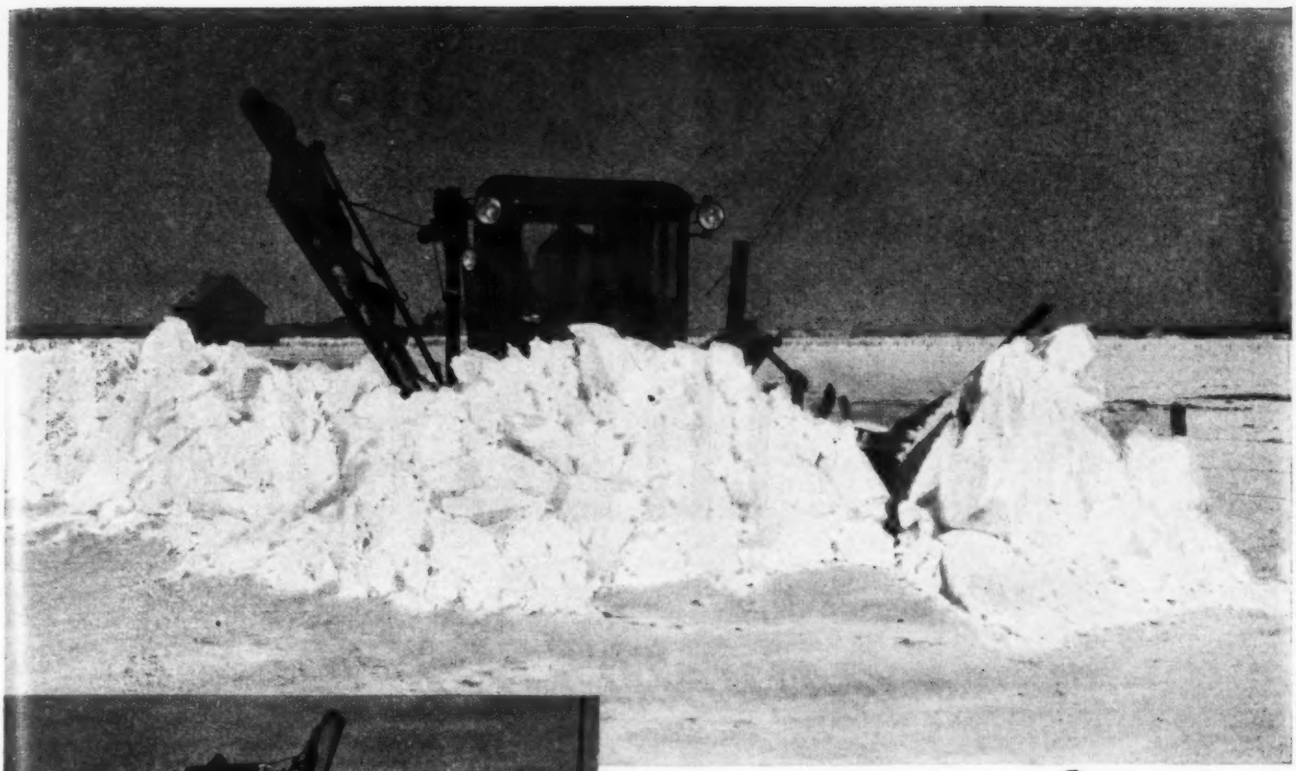


Blockade Buster

In the north, an Austin-Western Power Grader rounds out its year of usefulness by doing a better and more diversified job of plowing snow than can be done by any other motor grader.

All-Wheel Drive provides maximum traction for the Giant "V" Plow, mounted extra close to the powerful front drivers. No other motor grader is fitted with as big a plow—because no other motor grader could handle it.

All-Wheel Steer makes the Austin-Western more maneuverable than any other motor grader; simplifies and speeds up the handling of a wide variety of jobs, like plowing around a corner, plowing out farm drives and working close to signs and mail boxes.

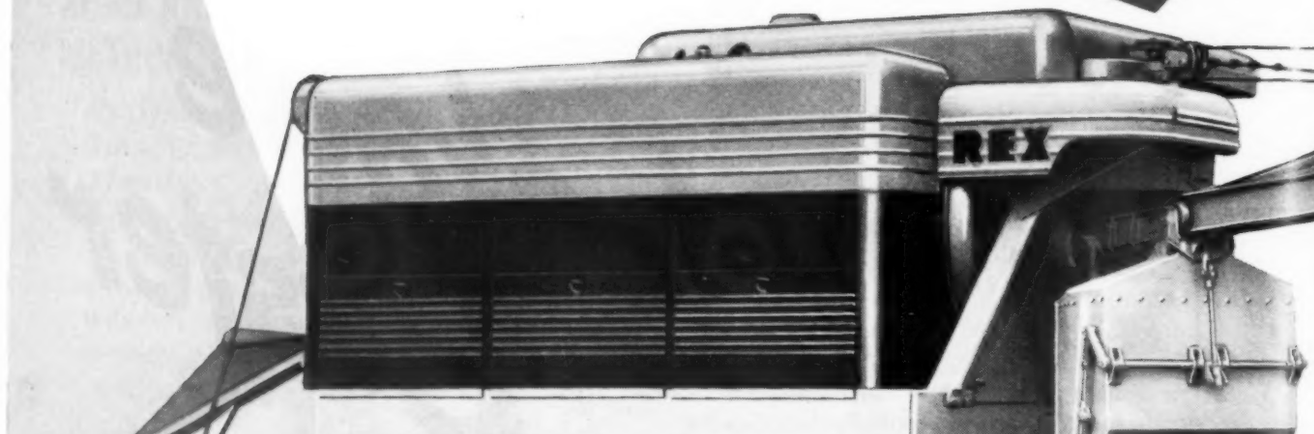
Working together, All-Wheel Drive and All-Wheel Steer resist the side thrust that is always present when widening-out and winging. Ask the operator. He will tell you "no other machine can plow snow like an Austin-Western '88,' '99-H' or Master '99'."

AUSTIN-WESTERN COMPANY · AURORA, ILLINOIS, U. S. A.

Austin-Western

the new

as new inside

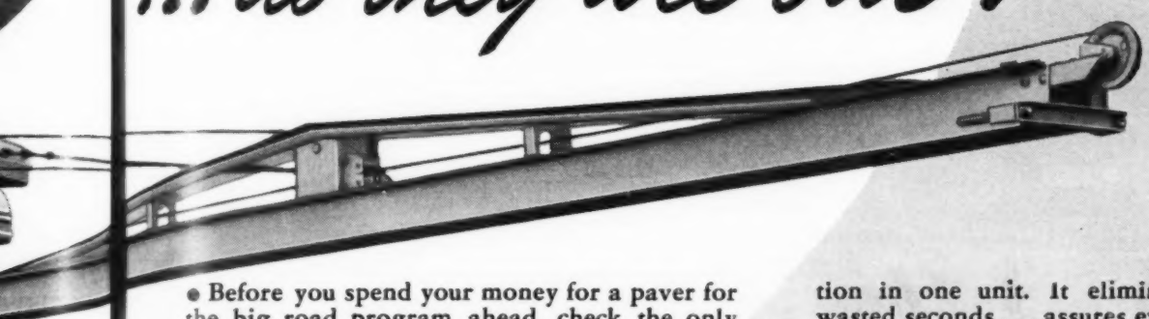


● 34E SINGLE AND
DOUBLE DRUM PAVERS

CHAIN BELT
REX
COMPANY

Rex Pavers

... as they are out!



• Before you spend your money for a paver for the big road program ahead, check the only basically new pavers in the industry. Rex Pavers are new *inside and out*... from the ground up... field-tested and proved by 4 years of actual experience in the roughest, toughest kind of high speed production. Just look over the new advantages Rex will give you:

NEW ACCESSIBILITY. The new streamlined shielding makes these the most accessible pavers you've ever seen. Big, easy-opening doors permit quick access for lubrication and inspection. And streamlining keeps dirt off the working parts ... assures less clean-up time, lower maintenance, longer life.

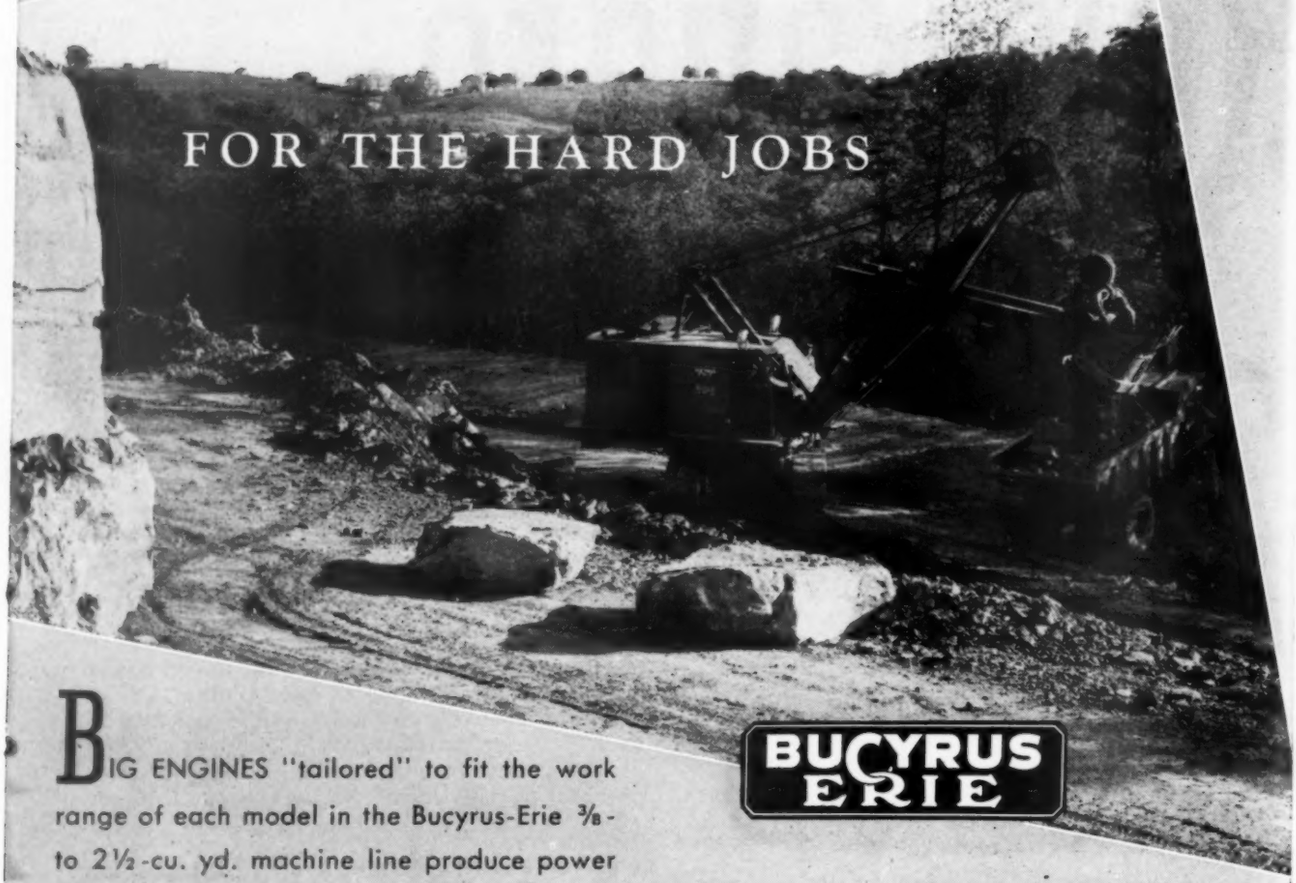
NEW HYDROCYCLE CONTROL. Here's the greatest advance ever made in paving speed and ease of operation. This foolproof cycle control combines batchmeter and automatic cycle operation in one unit. It eliminates those costly wasted seconds ... assures exact timing. All the operator does is give the control a gentle push and Hydrocycle takes over ... operates the charging, batch transfer, discharging and water control. And, at any time he can cut into the cycle and take over operation by hand.

NEW OPERATOR COMFORT. With the new Rex Pavers, the operator never has to leave his comfortable seat. With Hydrocycle, the roomy, clear vision deck, and the grouped controls, he can keep the paver going at top speed all day long with far less effort.

AND NEW simplicity of design, new rugged construction, new ease of spreading, new type crawlers ... there's a whole host of new features it will pay you to check. For all the facts, see your Rex Distributor or write Chain Belt Company, 1685 W. Bruce St., Milwaukee 4, Wis.

CONSTRUCTION MACHINERY

Plenty of Punch



BUCYRUS ERIE

BIG ENGINES "tailored" to fit the work range of each model in the Bucyrus-Erie ⅜- to 2½-cu. yd. machine line produce power to meet all demands of excavator and crane service. Simple, efficient, long-lived machinery keeps this power always under the complete control of the operator, who can apply it exactly where he wants it, when he wants it, in the amount he needs.

Transmission is efficiently yet simply lubricated, and wide use of anti-friction bearings for a smooth power flow over a minimum of moving parts further reduces power losses through friction. The smoothness and balance of Bucyrus-Erie power add ease of operation to capacity for long hours of sustained production. Durability of parts and reduction of wear keep maintenance costs low, too.

There are many more reasons why Bucyrus-Eries are "tops" among owners and operators alike. See your Bucyrus-Erie distributor for more information on how Bucyrus-Eries can help solve your excavating problems efficiently and economically.

36E47

BUCYRUS-ERIE CO. SOUTH MILWAUKEE, WISCONSIN

IN NORTHERN MINNESOTA'S FAMOUS GUNFLINT TRAIL REGION...WHERE SNOW FIGHTING IS TOUGH

...Four FWDs keep 275 miles of isolated highway clear of snow from mid-November until late March

In Cook County, Minnesota — where winter comes early, stays late, and plays rough — FWD four-wheel-drive trucks keep roads open.

Look at last year's record! Operating from their base at Grand Marais, FWD trucks kept 275 miles of county roads snow-free from mid-November until late March. What's more, only four units were needed to do this tremendous job. And here's why.

With all four wheels driving, you remove snow efficiently at speeds of 20 to 30 miles per hour with FWDs. With front wheels pulling, back wheels pushing, you drive through deep drifts without bogging down. On hilly roads — such as Cook County's famous Gunflint Trail — the grip of four driving wheels pulls you up steep grades safely.

And when winter is over, you can put the same trucks to work grading roads, hauling gravel, and performing other heavy-duty jobs.

To find out why FWD four-wheel-drive trucks are the number one choice of highway departments everywhere, see your nearest distributor or write for complete information.

Model HA-FWD
Owned by Cook County, Minnesota, opens street to high school in Grand Marais.

FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin
Canadian Factory: KITCHENER, ONTARIO
World-Wide Sales and Service

FWD

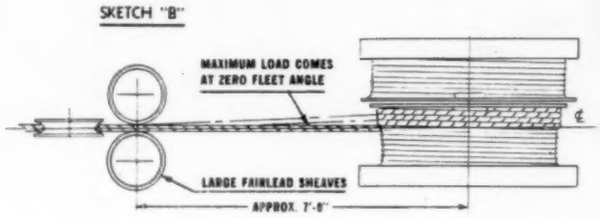
America's Foremost Heavy-Duty Truck

AGAIN THIS WINTER MORE FWDs WILL BE MOVING MORE SNOW

Look at a LIMA Dragline from these angles

1. Proper fleet angle is an important factor in cable life: the smaller the angle, the less the wear on cable by flanges of the sheave. Sketch "A" at right, shows a common method of cable reeving where large fleet angle and piling at maximum load cause excessive cable wear. Sketch "B" shows the LIMA method, achieving small fleet-angle—with *zero angle at maximum load*, by proper placement of drum with relation to fairlead and large diameter drums with short traverse. Cable wear is further protected by large, deep throated sheaves and grooved drums.

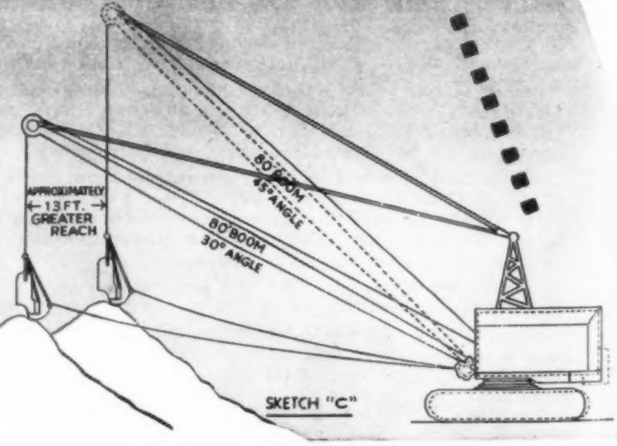
1. SMALL FLEET ANGLE OF THE FAIRLEAD CABLE MEANS LONGER LIFE AND LESS DOWN TIME



2. Sketch "C" illustrates how a well balanced LIMA dragline with 80 foot boom, working at 30° angle, achieves 13 feet greater reach than a light weight machine with same length boom, but which cannot go lower than 45° without tipping.

LIMA draglines have low center of gravity, proper weight distribution and long wide crawlers—all contributing to lower possible work angle of boom and greater working ranges.

2. LOW WORK ANGLE OF THE BOOM MEANS GREATER WORKING RANGE AND INCREASED OUTPUT



LIMA draglines are designed and built for dragline work. Every part is engineered for greatest output with minimum maintenance. Sizes and capacities for practically every requirement. Get all the facts before you buy your next dragline . . . LIMA also makes power shovels from ¾ to 6 yards and cranes from 13 to 100 tons.

Lima Shovel and Crane Division

LIMA, OHIO

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

LIMA HAMILTON CORPORATION

Only Dodge Builds "Job-Rated" Trucks

"Job-Rated" TO SAVE MONEY . . .

You'll save money with a truck that's built *to fit* your job. Any truck that's too big for its job, will waste gas and oil. Or, if it's too small it won't stand up . . . maintenance costs will be excessive. There's no need to drive expensive "misfits." Just see your Dodge dealer. Tell him what you haul . . . the weight of your loads . . . and your hauling conditions. He will recommend the right "*Job-Rated*" truck for your job.

"Job-Rated" TO SAVE TIME . . .

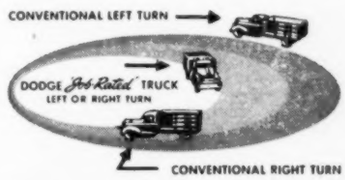
Dodge "*Job-Rated*" trucks save valuable time, too, simply by keeping out of the repair shop. They save time, because each truck is engineered with exactly the *right* one of 7 *different* truck engines. Each one has exactly the right clutch, transmission, rear axle and gear ratio to haul a specific load, over specific roads, with time- and money-saving efficiency.

"Job-Rated" TO LAST LONGER . . .

Naturally, a truck that fits the job . . . a truck "*Job-Rated*" with exactly the *right* units, from engine to rear axle . . . will *last longer!* This means lower upkeep costs. It also means on-the-job dependability and satisfaction. Ask your Dodge dealer to show you *why* the *right* "*Job-Rated*" truck can save money, save time, and last longer . . . on *your* hauling job!

You'll profit from these NEW features, too!

New "cross-steering," with shorter wheelbases that accommodate full-size bodies, enable you to turn in *much smaller* circles. You can park, back into alleys or up to loading platforms with much greater ease.



Front axles have been moved back, engines forward. More load is on the front axle . . . giving *much* better weight distribution. With wider tread axles, longer springs, and "Air-O-Ride" seats you get a marvelous new "cushioned ride."

New "Pilot-House" cabs, with nearly 200 square inches more windshield glass area, give tremendously increased vision . . . and safety!

For the location of the Dodge dealer in your community, consult the yellow pages of your local telephone directory

VISIT THE BIG DODGE "*JOB-RATED*" TRUCK AND EQUIPMENT SHOW
Madison Square Garden, New York City
November 18-21, 1948

DODGE "Job-Rated" TRUCKS

4 BRAND NEW MICHIGAN TRUCK SHOVEL-CRANES...

SERIES 8

½ YARD
8 TON

Here's a range of four completely new half-yard MICHIGANS designed to meet *your* particular job requirements. Your choice of *single-engine* power or *twin-engine* power, *two-wheel drive* or *four-wheel drive*. Remote control, which permits fast, easy maneuvering on the job, is available as optional equipment on the twin-engine models.

Get all the facts! Write for your copy of Bulletin 101.

MICHIGAN

MICHIGAN POWER SHOVEL CO.

480 SECOND STREET, BENTON HARBOR, MICHIGAN, U. S. A.

Above: the S. S. Harvester at docks of International Harvester's Chicago Steel Mill.

Quality BUILDS Quality

THAT'S THE INTERNATIONAL WAY

from raw materials to finished trucks

International Truck quality begins long before truck building starts. It begins with control of the raw materials that produce rugged truck strength and power.

Quality Builds Quality! That rule governs the selection and approval of every material and part used in every International Truck. Here's one example:

■ International Harvester's own ships bring iron ore from Minnesota's Mesabe Range down the lakes.

■ These ships also transport coal from International Harvester's mines in Kentucky. The coal is loaded at the lake port of Sandusky, Ohio.

■ Ore and coal are brought to International Harvester's steel mill in Chicago, where *Quality* steel, including one of a special type developed by International Harvester's technicians, is made to rigid specifications for International Trucks and International Engines.

Yes, *Quality Builds Quality.* Note with what success:

For 16 years more new heavy-duty International Trucks have been bought by American commerce and industry than any other make.

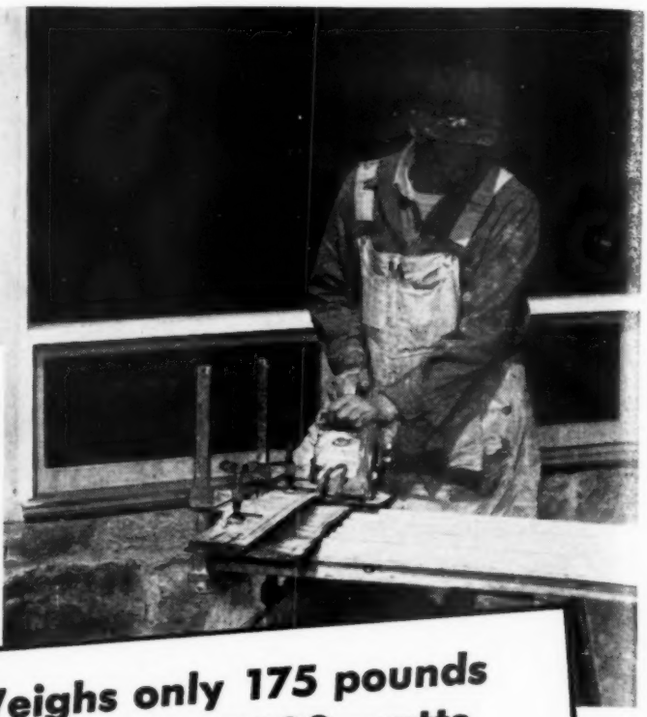
Motor Truck Division
INTERNATIONAL HARVESTER COMPANY · Chicago

Tune in James Melton on "Harvest of Stars." CBS Wednesday Evenings.

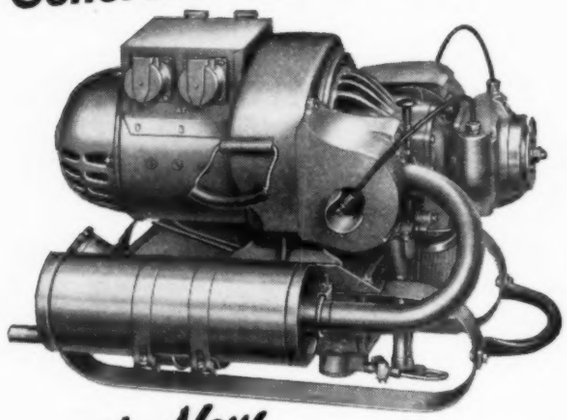
THIS EMBLEM IDENTIFIES GREAT TRUCKS
INTERNATIONAL

INTERNATIONAL Trucks

Carryable Power for Electric Tools



Weighs only 175 pounds
Generates 5000 watts



The New
HOMELITE

Carryable **DUAL-PURPOSE GENERATOR**
(Gasoline-Engine-Driven)

For operating both high-cycle and standard universal 110 volt tools. Write for complete information.

HOMELITE CORPORATION
910 RIVERDALE AVENUE, PORT CHESTER, NEW YORK

Manufacturers of Homelite Carryable Pumps
Generators • Blowers • Chain Saws

maximum flexibility . . . maximum payload
maximum operating efficiency

Sterling

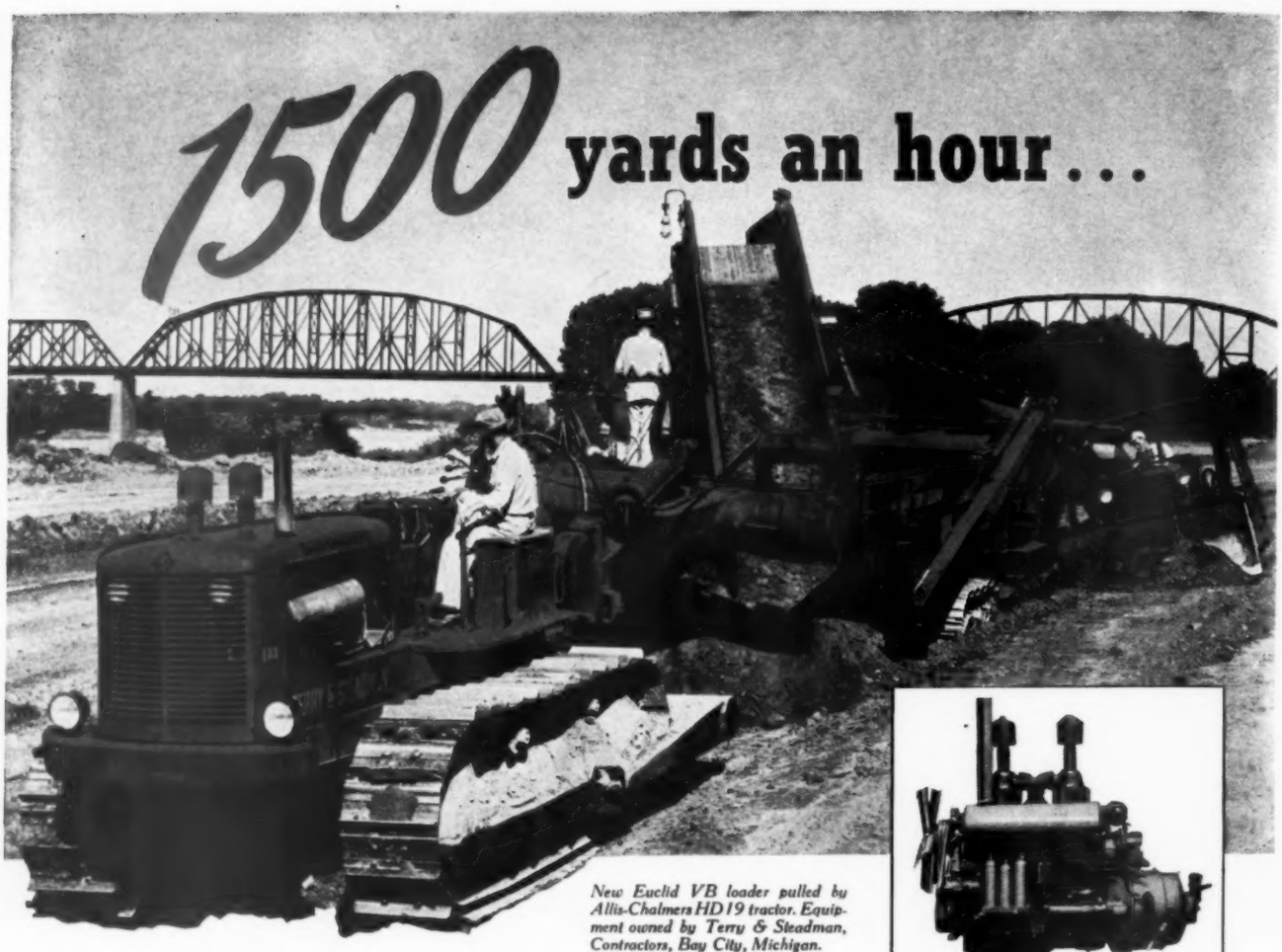
MILWAUKEE, WIS.

Job engineered, and sturdy in construction, Sterling heavy duty motor trucks are adaptable to any type of operation. For economy and steady, continuous hauling of heavy loads, choose Sterling, a famous name in motor trucks since 1907.

- Chain Drive (4 x 2 and 6 x 4)
- Enclosed Drive (4 x 2 and 6 x 4)
- Multi Wheel Drive (4 x 4 and 6 x 6) ● Gasoline ● Diesel

BRANCHES AND DEALERS IN PRINCIPAL CITIES

1500 yards an hour...



New Euclid VB loader pulled by Allis-Chalmers HD 19 tractor. Equipment owned by Terry & Steadman, Contractors, Bay City, Michigan.

General Motors Series 71 Diesel Engine as adapted by Allis-Chalmers for the HD 19 tractor.

24 hours a day

WHEN this Euclid VB loader and Allis-Chalmers HD 19 tractor went to work on the Louisville, Kentucky levee project, the dirt really began to fly—1500 cubic yards an hour, 24 hours a day.

"Almost double the amount other types of equipment move," the superintendent tells us. And no wonder! For the HD 19 boasts a wealth of smooth, dependable General Motors Diesel power.

Because the GM Diesel engine operates on the 2-cycle principle, it provides power at every downstroke. So the "six" performs like a "twelve"—turning out more work and sticking to it longer.

Whatever your need for power may be, it will pay you well to standardize on General Motors Series 71 Diesels. Not only are they frugal with fuel, but these engines are long-lived, durable workers that are easy to maintain. And you get an added bonus of parts interchangeability between engines of different sizes. See your local dealer, or write directly for further details.

DETROIT DIESEL ENGINE DIVISION

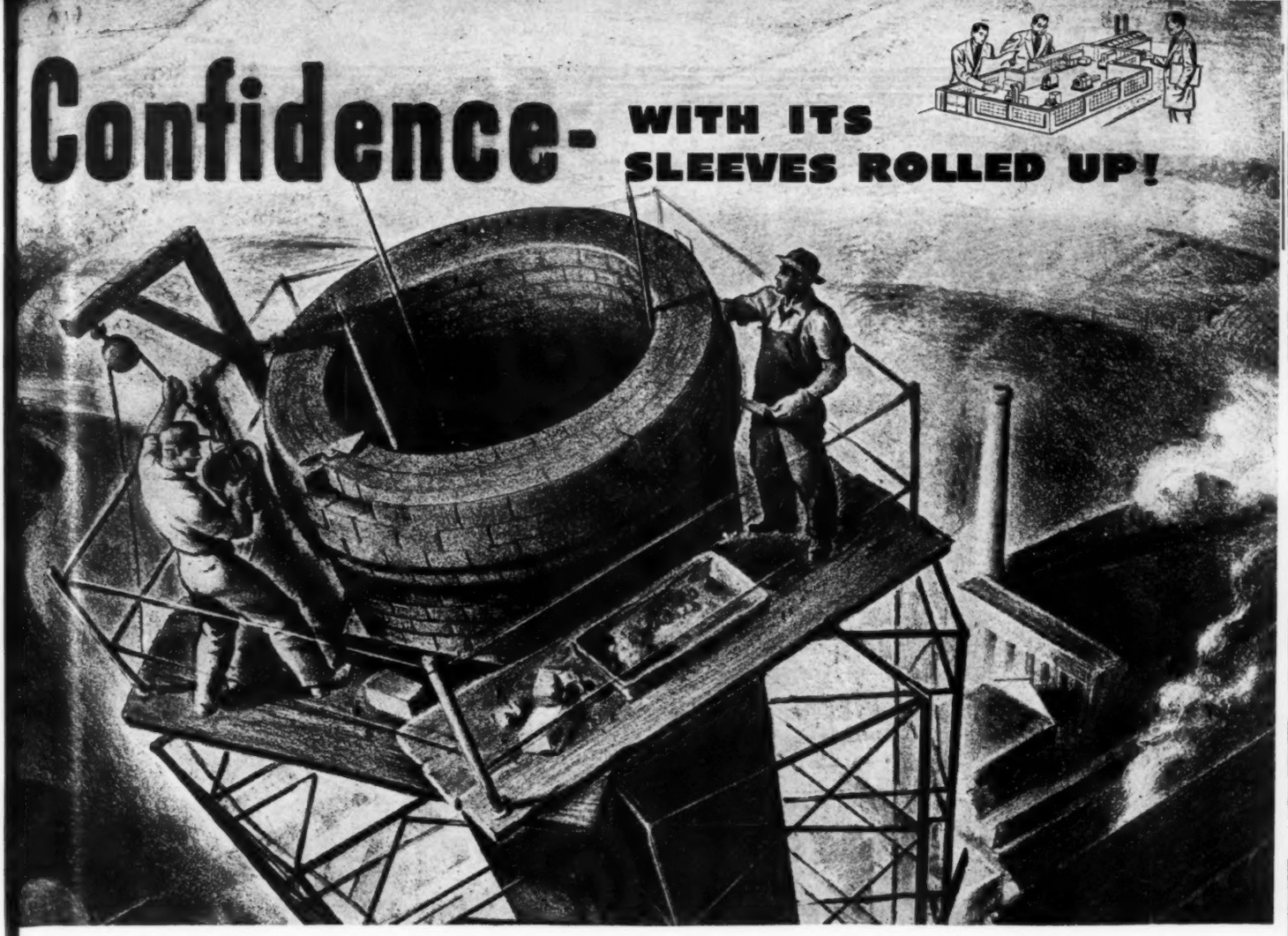
SINGLE ENGINES.. Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS.. Up to 800 H.P.

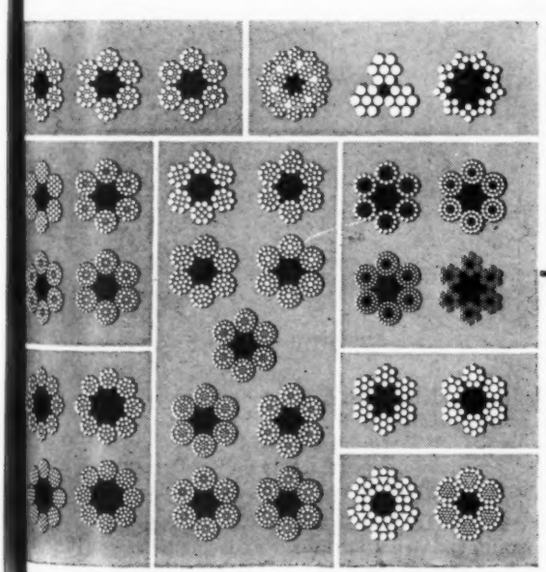
GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

Confidence- WITH ITS SLEEVES ROLLED UP!





STRAIGHT AND STALWART, every factory stack is a towering symbol of man's faith in the future... industry's confidence in its ability to create and to expand production for better living and a richer world.

With confidence like that, Roebling has pioneered in developing and making an extraordinary range of products indispensable to industry. And the confidence that its products and engineering skill have earned in every industrial field is one of Roebling's most valued assets. Every Roebling employee is striving to safeguard that confidence by making products and rendering services that are of maximum utility to you.

YOU CAN'T GO WRONG WITH THE RIGHT WIRE ROPE

EVERY TYPE of Roebling Wire Rope is right for certain service. But that's not enough... the important thing is that you choose the one rope that's *right* for your own job... the rope with the right balance of strength, flexibility, fatigue and abrasion resistance to give real economy over a long period of use.

Your Roebling Field Man will gladly study your requirements, and you can have full confidence that the rope he recommends will give you top returns per dollar. Whatever type it is, preformed or non-preformed, it will have behind it Roebling's unequalled experience in research, development and manufacturing the finest wire products that can be made.

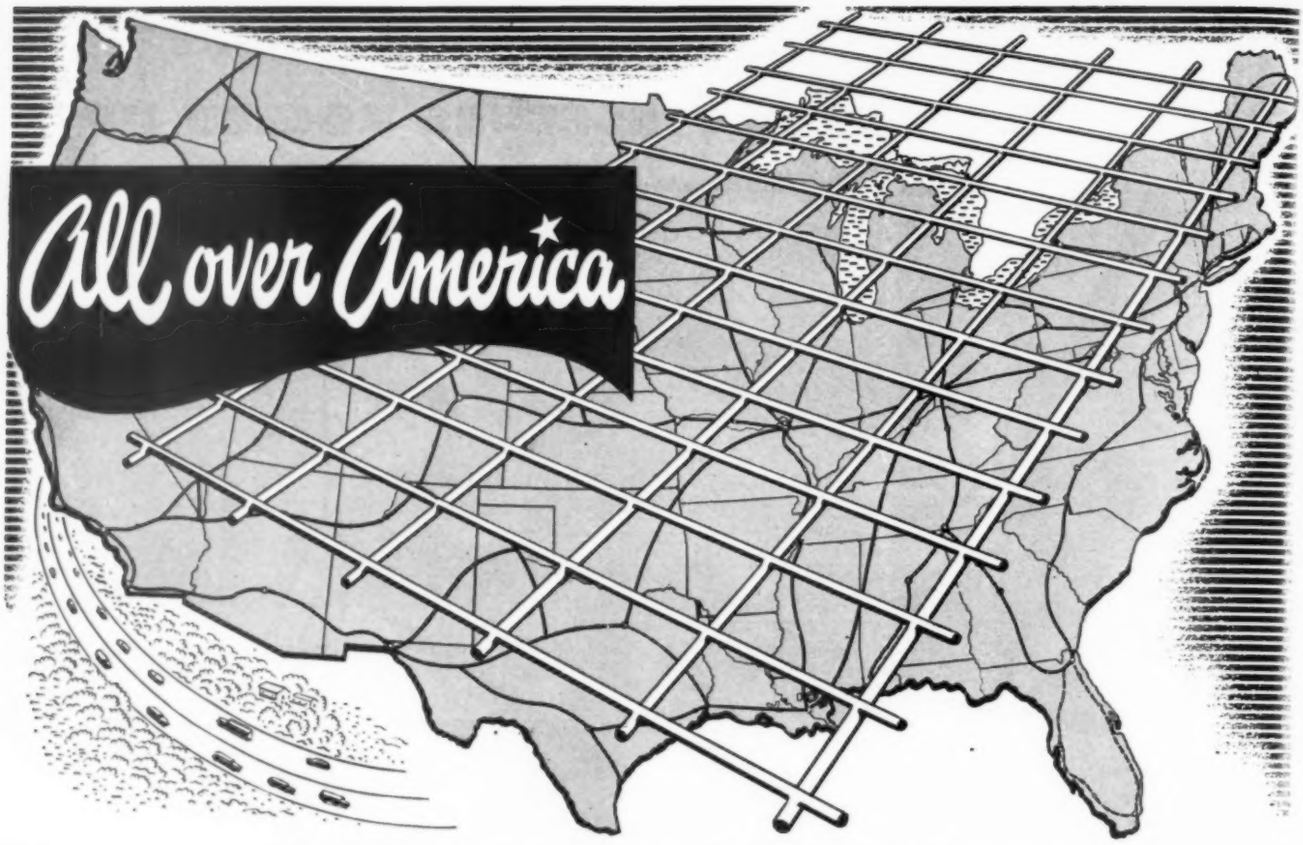
Call or wire the nearest Roebling branch office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

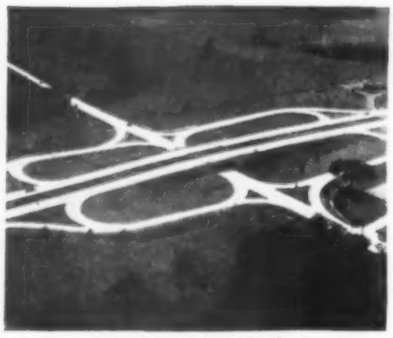
A CENTURY OF CONFIDENCE ROEBLING

JAR ROEBLING

★ WIRE ROPE AND STRAND ★ FITTINGS ★ SLINGS ★ SUSPENSION BRIDGES AND CABLES ★ AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS ★ AERIAL WIRE ROPE SYSTEMS ★ ELECTRICAL WIRE AND CABLE ★ SKI LIFTS ★ HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL ★ SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH ★ LAWN MOWERS



Truscon Welded Wire Fabric Assures More Permanent Concrete Highways



—on modern cloverleafs

—on mountain passes

—on long straightaways

—on sweeping super-highways

Millions of square yards of Truscon Welded Wire Fabric have been used by America's highway designers and contractors . . . to definitely assure better, longer-lasting concrete highways. Performance records have proved that progressive cracking, heaving and faulting are effectively controlled when concrete is reinforced with Truscon Welded Wire Fabric.

For strong, durable highways, plan to use Truscon Welded Wire Fabric and associated Truscon road-building products. An experienced Truscon highway engineer will be glad to assist in solving your particular highway problems.

TRUSCON STEEL COMPANY

YOUNGSTOWN 1, OHIO

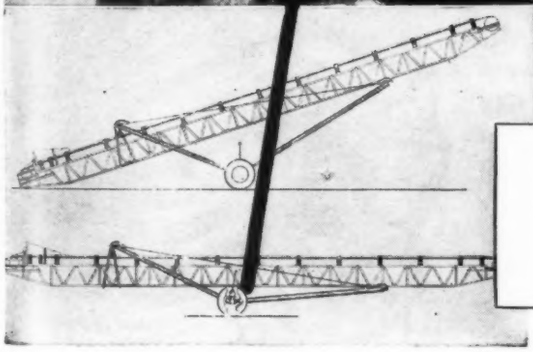
Subsidiary of Republic Steel Corporation

Manufacturers of a Complete Line of Welded Steel Fabric... Concrete Bars... Contraction Joints... Dowel Assembly Units ... Curb Bars... Complete Steel Buildings

TRUSCON WELDED WIRE FABRIC

Up again down again...

In less than 10 Minutes!



Moving conveyors from one job to the next used to take hours of valuable time, good men and equipment.

Now, it's a matter of minutes. One man can easily elevate a 60′ conveyor in 9 minutes with the new *Pioneer* Hydraulic Conveyor Truck. A twist of a valve, and in 60 seconds the conveyor is back in its cradle . . . ready for another move.

Low overheads are no problem for this smooth rolling truck for it's *built without masts* and requires only 7′3″ clearance.

The *Pioneer* Hydraulic Conveyor Truck handles conveyors up to 60′ in length with belts up to 30″ wide. Write for complete details today.

PIONEER ENGINEERING WORKS, INC.
1515 CENTRAL AVE. • MINNEAPOLIS 13, MINNESOTA

●A sturdy Blackhawk Pump boosts the conveyor into exact feeding position. Once spotted, it's locked securely in place. A low center of gravity, 8′ tread, and pneumatic tires add to portability.

BUY BOTH!

Higher Output, Lower Upkeep!

Pioneer

Continuflo **EQUIPMENT**

Rolls Up the Yardages

Cuts Down the Costs

EARTH MOVER ALL-WEATHER
for drawn vehicles and general traction

BUY and SPECIFY

GOODYEAR — *it pays!*

HERE'S the tire that moves big loads at rock-bottom costs — *because it's designed and engineered for the job.* It's Goodyear's Earth Mover All-Weather—the "right" tire for the wheels of drawn vehicles, or for general traction. "*Right*" for rolling, because its wide, rounded contours provide maximum flotation, prevent deep penetration of the ground, reduce sideslip on fill, give sure-footed *easy* going.

Fact is, Earth Mover All-Weather tires—like *all* Goodyear work tires — are first choice with users. And they *stay* first choice because they keep on delivering low-cost, long-life performance. That's why year after year, *more yards are moved on Goodyear off-the-road tires than on any other kind!*

A RIGHT TIRE FOR EACH JOB

SURE-GRIP
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GOODYEAR

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ROADS AND STREETS

October, 1948 • Vol. 91 • No. 10

Teamwork, Trucks and Timing

Payoff at Chicago Municipal Airport

Chicago's largest recent paving project reached 2500-3500 ton daily pace on hot-mix resurface in midst of 400 daily flights

By Harold M. Maxwell
Special Correspondent, Roads and Streets

WHO says army and navy men can't get along? This summer Ray Brownell, Chicago municipal airport engineer and ex-army engineer officer, and Doug Fuller, who is superintendent for Union Contracting and Engineering Co. and an ex-navy Sea-Bee officer, pooled their efforts to make short work of repaving Chicago's mile-square municipal airport. The whole job—3,950 cu. yd. of concrete patching for taxiways and 100,000 tons of hot-mix resurfacing for taxiways and runways—was bid at $1,338,000. The big paving show of the year around Chicago.

Chicago's municipal airport, like other airports all over the country, was designed for much lighter planes than the 50 or 60 ton giants which take off and land there now. Some of the runways and taxiways or 10 or 12 years old. The old 12-in. asphalt macadam runways and 7-in. plain concrete taxiways had taken a beating. In some places as much as 6 in. of black base were required to restore the crown of the runways.

Pumping at the taxiway joints caused extensive displacement and cracking. The 26 miles of storm drains, however, were in good shape and needed no repairs.

Asphaltic Concrete

Runway surfaces were primed by a pressure distributor with 0.10 gal. of RC-O per sq. yd. Illinois "I-11" type mixes were used for both binder and surface courses on all runways and taxiways. The I-11 surface mix is an Illinois highway asphaltic concrete containing 55% limestone (½-in. maximum); 33% sand, 5% limestone dust and 6% asphaltic cement having 100-120 penetration. It was laid at 275° F. and ready for traffic the next day. The I-11 binder placed first in two or three 1½-in. layers, contained larger stones (1-in. maximum) and no dust. The entire runway surface was given an RC-2 seal coat, and limestone chips were added for night visibility. The distributor applied the seal coat, and a chip spreader deposited 20 lb. of chips per sq. yd. Rubber-tired rollers consolidated the chips. Taxiways were pitched with concrete and given a 3½-in. 2-layer I-11 asphalt surface.

Four Paving Teams

Asphalt paving was laid by four paver teams, which placed as much as 3,600 tons in a 9-hour day. In addi-

★ Hot-mix delivery trucks, waiting to cross a runway. "Zip-zip" truck dispatching was a big factor in achieving the huge daily yardage at Chicago's municipal airport

★ Loaded hot-mix trucks lined up at the airport gate to begin work

★ (Middle scene): Patching work in progress on concrete apron. Corner breaks being broken out and material loaded into trucks by Traxcavator

★ Rapid Pavement Breaker outfit, with hydraulically controlled ram unit, was used to break up areas to be replaced. Compressor is a Jaeger

tion to a 10-ft. Barber-Greene paver, each team had an 8-ton tandem roller and a 3-wheel 10-ton roller. The 8-ton rollers were used for final rolling. Asphalt-laying started at 7:30 a.m. and ended at 5:00 p.m.—6 days a week. Frequently, two spreaders worked side by side, laying a 20-ft. wide strip.

Three Chicago plants furnished the asphalt for this project. Union Contracting and Engineering Co., the principal contractor, was 7 miles from the field. The two subcontracting plants, Rockford Construction Co. and Asphalt Paving Co., were 8 and 14 miles away. Each plant has a capacity of about 120 tons per hour.

Keeping the four finishers supplied with hot mix from distant points over Chicago's busy streets was the tough and important job of another Chicago subcontractor, the Charles J. Wilson Co. Wilson, who keeps close tab on his dump trucks, believes in timing. He employed forty-eight 12 and 14-ton trucks. Two trucks left the main plant every 10 minutes. They maintained this schedule all day every day. Freight trains were about the only things that stopped them. No time was lost patching tires. The dispatcher phoned tire troubles from the airport and a new tire was ready at the plant when the truck returned for loading.

Truck Maintenance

At night the 48 trucks were parked outdoors at the main plant where oil, gas and water were stored and two mechanics were on duty. One mechanic arrived at 6:00 a.m. and checked oil, water and tires. The other arrived at 9:00 a.m. and stayed till the last truck was back at 7:00 or 8:00 p.m. He made needed repairs and adjustments. Thus, for most of the day there were two mechanics available. All trucks were gassed at night.

At about 7:15 every morning the dispatcher at the airport gate lined up the loaded trucks. As the four spreaders got to their positions at 7:30 a.m. the dispatcher sent two trucks at a time to each spreader. From then on it was his duty to see that each spreader continued to have two trucks at all times—one actually loading the spreader and the other ready. The dispatcher prevented much confusion. Although the airport designated certain runways safe for truck and paving traffic, there were many times when a "safe" runway had to be blocked temporarily. Then the dispatcher directed the trucks up a taxiway. Constant contact with the airport tower was maintained with a 2-way radio mounted in a passenger car. The dispatcher did his work well. All flights were on schedule—400 a day!

Taxiway Repairs

Breaking up, removing and patching the badly deteriorated 7-in. concrete taxiway slabs was the job of Standard Paving Co., Chicago. Some of the plain concrete did not need to be replaced, but the concrete at many of the joints was badly displaced and cracked. In many cases entire slabs had to be removed. A truck-mounted hammer was used to break the damaged concrete into pieces small enough for a man to remove with a pick. The breaking rig consisted of a Jaeger UD

Made Hay During Fine Weather

The fast daily clip at Chicago's municipal airport was maintained during three weeks of fine weather in late August and September, enabling the contractors to set something of a record. Read article for details.

★ Several makes of 2 and 3 wheel rollers, two to a finisher, were used. Makes included Galion, Austin-Western and Buffalo-Springfield

3 compressor and a 3,000-lb. hammer mounted on a 9-ton truck. One man drove the truck while another operated the hammer. The hammer operator, in addition to controlling the valve that drove the hammer, could move the hammer laterally by revolving the rig mounted on the truck. When he wanted to move forward a few feet he signaled the truck driver with his "Pop-eye" whistle. Joe Zera, Standard Paving's superintendent, says that this truck-mounted hammer broke up 200 sq. yd. an hour. Broken concrete was loaded into trucks by a D7 Caterpillar front-end loader. The damaged concrete, 7 in. thick, was replaced with 10-in. deep patches. Bad areas in the taxiways were broken on half of the 150 ft. of width at a time.

As part of the finish-up work, a stripping truck is placing 101,750 sq. ft. of pavement marking paint.

The foregoing project is under Chicago's department of public works, Oscar Hewitt, commissioner, with John Casey, supervisor of airports.

N. J. Department Installing Roadside Phones

In response to favorable reaction from automobilists on the convenience of roadside telephones, New Jersey's state highway commissioner, Spencer Miller, Jr., has approved the installation of two units on the new Route S-3 under construction in Clifton, Passaic County.

The booths will be approximately one mile apart, one on each side. At booth locations the paving will be of extra width to allow turnouts by buses and trucks.

New Jersey previously installed phone booths at three stations on Route 25, between North Avenue, Elizabeth, to Port Street, Newark. They are adjacent to meadowland area where no facilities are available for summoning aid in the event of breakdowns. Other installations are also contemplated.

Cement Research Laboratory Under Construction

First concrete for the Portland Cement Association's new two million dollar research and development laboratory was placed recently in the Village of Skokie, 15 miles northwest of Chicago.

The lever which started the mechanism placing the first cubic yard of concrete was released by Charles E. Aspdin of Hasbrouck Heights, N.J., the great-great-grandson of Joseph Aspdin who invented portland cement in Leeds, England, in 1824.

Others who participated in the ceremony were Frank T. Sheets, president of the Association; W. A. Wecker, president of Marquette Cement Manufacturing Company; S. W. Storey, president of the General Portland Cement Company and the Consolidated Cement Corporation; and W. C. Russell, president of Peerless Cement Corporation; all directors of the Portland Cement Association.

The new laboratory group is to replace and increase the Association's present research facilities at 33 W. Grand Avenue in Chicago, according to Dr. A. Allan Bates, the Association's vice president.

●

New PRA Division Office—The District office of the Public Roads Administration at Juneau, Alaska, has been raised to the status of a division office. Hugh A. Stoddart, formerly highway engineer in the district office at Portland, Oregon, will be in charge as division engineer. He will supervise highway work in national forests and in cooperation with other Federal agencies in Alaska.

★ A pair of Barber Greenes in full swing on the Chicago airport resurface. Little hand raking was necessary except at intersections

EDITORIAL

★ We're Getting a Maintenance Bargain

A report from PRA headquarters, sifting state highway maintenance figures nationally, shows that the average cost of road maintenance has increased 86% from the 1935 level.

Can you name another field in which costs have risen so little in this time? It would be hard to do so. The fact is, taxpayers are getting a lot of efficient, hard working, loyal effort for their money here. Road maintenance workers in many states, from patrolmen on up to the chiefs, are unsung heroes, in a way, and one of these days some feature writer ought to land in the Satevepost with a story of the day-by-day slugging, the emergency achievements, and the ingenuity with materials and equipment, that can be credited to this particular "Bureaucracy."

But the story isn't all to the good from the public's standpoint, or from the maintenance workers'. The average cost of maintaining a mile of road ought to be much higher in many states. The funds are having to be stretched too thin.

The pay of supervising engineers hasn't risen enough to give these men a square deal, this being the cost element which has risen the least.

Not all state highway maintenance organizations make an equal showing in efficiency, zeal and alertness to duties.

Not all have made reasonable progress in retiring their old, obsolete equipment and making the most of new labor-saving, job-expediting power machinery and power hand tools.

Not all departments are sufficiently free of the "political" appointments and political domination which stifle incentive and keep second-raters in jobs.

Highway maintenance today is a veritable giant of a business, entailing over a billion dollars annually for all road classes. But there is no room in the business for complacency, smugness, or even a "we're doin' fine" spirit, unless it will lead to a progressively better showing.

★ Single File Through Towns

One hot day this past summer this writer lost half an hour and his temper while driving through a small Ohio community along U.S. 30. It wasn't that the streets were narrow. They were 50 to 60 feet wide much of the time. But the Saturday traffic was strictly single-file.

Single-file traffic on urban sections that have room for three and four lane traffic is all too familiar a pattern today. Here is an opportunity to get big immediate results with a little money and thought. While long-range plans are being worked out for relocations, by-passes, belt lines or what have you, why not do something immediate to provide extra lanes on existing routes?

One answer is complete elimination of parking and even load-stops along one or both sides of the street. One side will often give big relief, and is not unpopular locally if the main shopping blocks are bypassed. This obvious solution has been tried in many places, but has failed because of on-and-off enforcement. One parked car can throw traffic back into single-file for several blocks. More often the scheme fails because the ban isn't carried clear through the congested area. Motorists are wary of the outside lane, knowing from experience that probably they'll come to an impasse in a block or two where the street constricts or parking is again permitted.

Other seemingly obvious aids include more careful attention to lane striping, and one-way routing along parallel streets.

What's the situation in your community?

★ Uniform Traffic Devices Manual

After many years of behind-the-scenes committee work a completely new manual of uniform traffic control devices has been issued. (See notice elsewhere in this issue.) Every engineer or official having responsibility for traffic planning and administration should become thoroughly acquainted with the contents of this monumental work, and wherever possible, take immediate steps to make his own particular standards and procedures conform.

The importance of greater uniformity in signs, markers and traffic control devices need hardly be restated. Those who had a part in the preparation of this manual, and in the committee work which steered it patiently through to final OK by everyone, should have a small niche in the hall of fame's highway engineering section.

★ When to Blame the Road?

Just when and how is the condition of the road itself a definite factor in accidents in traffic?

Last month's ROADS AND STREETS carried an account of a study of accident causes in North Carolina, which places the percentage of accidents due to road deficiencies at 8.1%.

While in no way discouraging this valuable type of data collection and analysis, we believe that the engineer should not attach too much significance to any definite figures of this kind. The importance of the roadbed is great or little, depending on the point of view.

It is great in that eventually a large part of our highway system must be reconstructed to safer design standards so that accidents will be less and less likely to happen; the figure 8.1% is a poor statement of the immensity of the rebuilding-for-safety job that

faces us in a thousand localities.

The roadbed's importance is little, by way of rebuttal, in that the driver shares the blame for the accident in some degree nearly 100% of the time. If a road is unsafe, he should drive more slowly and carefully or theoretically he could play safe by avoiding the road altogether!

At various times publicity on the need for better roads has cited the dangerous road conditions as a reason for digging up more highway funds. This is indeed an important reason for building better highways, but the relatively small percentage such as is mentioned in North Carolina could also be used to make a case against the road program, or the importance of the engineer's and maintenance man's work.

★ Fundamental Design Thinking

In this issue there is a little article, told in disarmingly simple language, which goes to the very core of good highway engineering principle. It tells how Texas highway department engineers went about designing a standard secondary-road bridge *for most economy*. No frilly handrails. No fancy special forming. Use of sheet steel arches for forming pan-type floor, permitting repeated re-use of forms and elimination of falsework.

It would seem that, not forgetting service and maintenance considerations, the Texas engineers have succeeded in developing a very sensible design. More than that, they have hoisted a signal flag for all highway engineering. All who deal with public funds should strive doubly toward the most results for the public dollar, substituting their own oft-repeated resolves and constant self-checking, in lieu of the direct economy interest of the "owner" that stimulates the privately employed engineer.

★ Editor's Log

Impressions while tooling along in the Ford, past summer: From El Centro, Calif., to Aroostook County, Maine, all in a few weeks—what a country! . . . and what a difference still in highway practices, not explainable by differences in climate . . . Notice that most of the accidents in the Southwest seem to be roll-overs (prevailing road speeds up near 70 mph) . . . Speaking of speeds, speed limit signs through towns are still ignored most everywhere because not enforced (or enforceable); for example, the 20 mph. limit along a new 6-lane boulevard, US 22 through Easton, Pa., I believe it was. . . .

The friendly flagman on a Maine road job, who wasn't there as we returned by: run over and killed . . . 12 stop light changes to go two blocks through downtown Washington, Pa., US 40. Hostile cops, manually controlled lights to favor local cross traffic. One of country's worst bottlenecks . . . Those granite curbs again in Massachusette. Razor sharp edges, inches away from speeding tires . . . Getting lost in Boston; even cab drivers do . . .

Swell concrete roads on the Wilbur Cross Parkway in Connecticut . . . ditto Pennsylvania Turnpike, after millions of tons of trucking, although a little pumping here and there today . . . future turnpikes, designers note: the bottleneck is at the gas stations . . .

Hazardous conditions still permitted in some states along construction. Traffic allowed through "at own risk," and shoulder trenches left overnight with too few flares; too obscure warnings; too perfunctory attitude all around. Penn Turnpike people do best job we've seen on this score.

How John Fitzgerald Invented A Flock of Sheep

By Halbert P. Gillette

About 50 years ago John W. Fitzgerald had a contract for regrading a road at Bakersfield, California, and for oiling it with asphaltic petroleum. The plowing, preparatory to crowning with a roadgrader, had just been completed, when a flock of about 1000 sheep passed over the road. Their hooves sank into the loose soil and began compacting it from the bottom, so that the hooves of the last sheep didn't sink at all.

"I was the maddest man in Kern County," said Fitzgerald. "If only the sheep had waited 24 hours until the road was crowned, I couldn't have asked for a better roller, as I told my wife at supper. Then suddenly it occurred to me that I could invent a flock of sheep."

His first mechanical flock of sheep was a redwood log studded with imitation sheep feet. It had an axle, of course, a tongue and a platform loaded with cobbles to give it weight enough to push the "feet" about 6 inches into soft, plowed soil. In 1893 goats had been driven back and forth over layers of earth in a reservoir embankment at Santa Fe, New Mexico, but it had occurred to no one then to "invent a flock of goats," or the earth compactor now called a sheepsfoot roller would be known as a goatsfoot roller. (See Gillette's Earthwork and Its Cost, p. 1090 and 1170).

Fitzgerald's ingenuity did not end with the invention of a flock of sheep, for he also invented the process of harrowing crude oil and soil together, and compacting them with the sheepsfoot roller. He secured a patent on the roller but neglected to patent the process of compacting oil and soil to produce a crude pavement. A patent on this process was secured by another person who sued a California contractor, Walter A. Gillette, for infringement. Gillette had become the first manufacturer of the sheepsfoot roller. Fitzgerald was a witness in the suit. Under cross-examination he was asked how he knew that he had used asphaltic oil instead of tar. He replied that they smelled differently. But, insisted the attorney, "You are no chemist, Mr. Fitzgerald."

"No, I'm no chemist."

"And you didn't hire a chemist?"

"No, I didn't need one. I know asphalt when I smell it."

"But you can't be sure that tar does not sometimes smell like asphalt."

"I never smelt tar like asphalt. Besides the oilman sold it to me for asphaltic oil and he knows his business and is honest."

"Will you please make the witness answer the question without dodging?"

"Your honor, may I illustrate what I mean?"

"Yes, do so, Mr. Fitzgerald."

"Well I know asphalt as well as I know my own name. I was christened John Fitzgerald. Every one has called me John Fitzgerald ever since. But, according to this gentle—this lawyer, how the hell do I know I'm John Fitzgerald?"

The $75,000,000 Penn. Turnpike Extension

THE Pennsylvania Turnpike Commission, having sold its $134,000,000 bond issue, of which $75,000,000 is for the construction of the Philadelphia extension, is now planning on the completion of this new project by Dec. 15, 1950.

The Philadelphia Extension will connect with the existing turnpike at Middlesex and will extend eastward 100 miles to a connection with Route 202 near King of Prussia, 7 miles west of the city of Philadelphia. The estimated cost is a follows:

Preliminary Costs	$ 500,000
Right-of-Way Costs	5,100,000
Construction Costs	$56,958,000
Contingencies — approximately 10%	5,642,000
Total	62,600,000
Engineering Costs	5,000,000
Miscellaneous Project Costs	500,000
Legal, Administrative and Overhead Costs	900,000
Purchase of Maintenance Equipment and Supplies	400,000
Total Project Costs (exclusive of interest during construction and financing costs)	$75,000,000

Some of the major items required for the completion of the project are as follows:

Grading	41,000,000	cu. yd.
Paving	7,900,000	sq. yd.
Steel	89,000	tons
Cement	4,300,000	bbl.
Sand	1,600,000	tons
Crushed Stone	2,700,000	tons

Design Criteria for Extension

The design criteria for the Philadelphia Extension are substantially the same as developed for the original turnpike. The facility, when constructed, will have all of the features of a modern express-type highway having maximum grades of 2%; long, sweeping curves having radii no less than 1910 feet; two lanes of traffic in each direction with opposing traffic streams separated by a 10-foot medial divider; vertical separation of grades at intersecting highways and railroads; traffic interchange facilities at strategic locations between the termini; long accelerating and decelerating lanes for traffic entering or leaving the highway and at gasoline and service stations; and shoulders of sufficient width to permit disabled vehicles to park off the travelled lanes.

Construction Features

The right of way will be 200 ft. wide, except at interchange and service station locations, where additional width will be necessary.

Access to the Philadelphia Extension will be provided by means of clover-leaf type interchanges, estimated to be 7 in number, similar to those used in the existing turnpike and located at the various main intersecting highways.

The project involves the construction of 123 grade separation structures and 94 stream and drainage structures. The bridge spanning the Susquehanna River will be approximately 4,600 ft. in length from abutment to abutment and will be the principal structure in the project. It will consist of steel girder spans supported on piers at intervals of approximately 100 ft. All structures will be of modern design with load capacities sufficient to carry the heaviest truck-trailers in use today and anticipated in the future.

Because of the type of terrain to be traversed the grading quantities will be less per mile than required on the original turnpike. The graded width of roadway, however, will be the same, measuring approximately 78 ft. transversely, thus providing for two 24-ft. roadways separated by a 10-ft. medial divider and flanked with shoulders 10 ft. in width between the edge of pavement and the gutters or embankment slopes. The pavement will consist of two 24 ft. concrete roadways founded on a selected subgrade material which will facilitate drainage under the pavement slab and thereby reduce damage caused by seepage, joint pumping and frost heaval.

It is the intention of the Commission to provide for service stations on the Philadelphia Extension for supplying gasoline and oil as well as restaurant service.

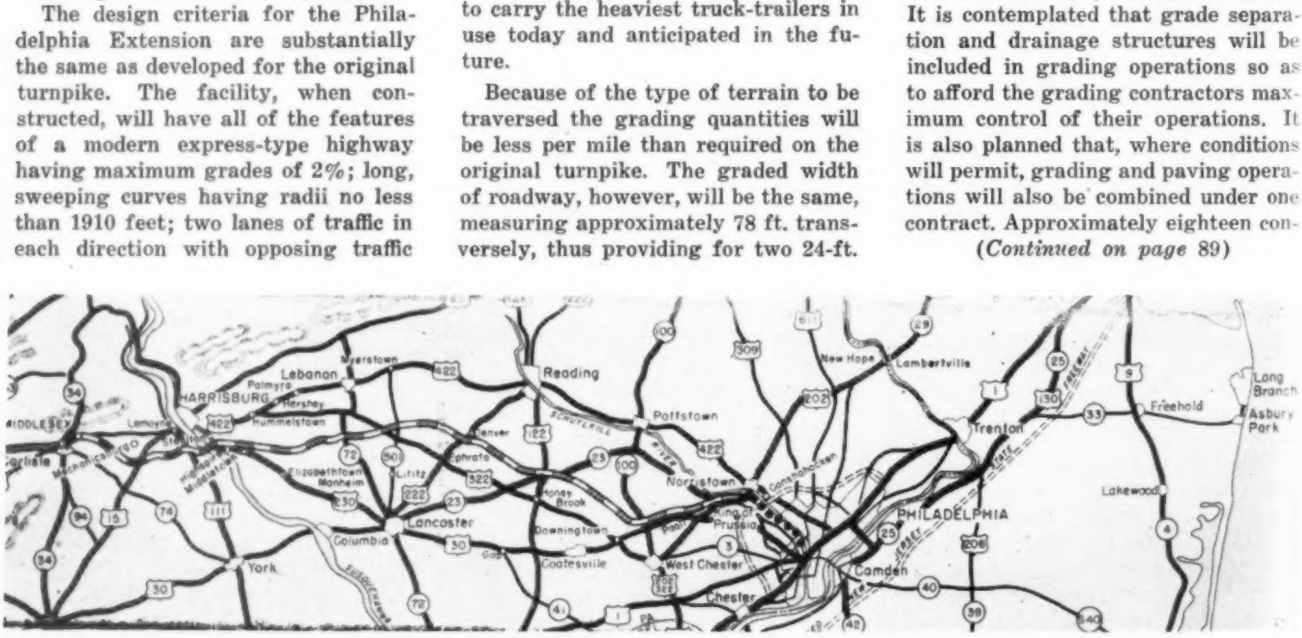
Four maintenance buildings will be constructed at selected locations along the extension to provide for equipment maintenance, repair and storage. These structures will be similar in design to, and somewhat larger than, the maintenance buildings on the existing turnpike.

In addition to the major items of construction, several roadway appurtenances which have contributed to the ease and comfort of driving on the existing turnpike will be incorporated in the construction of the Philadelphia Extension. Included are such features as delineation and lane marking of the full length of highway; complete illumination of all interchanges; service stations, restaurants, and rest rooms of approved design located at convenient intervals along the highway; and directional signs considerably larger than normally used on highways.

Construction Progress Schedule

The progress schedule is predicated on dividing the major items of work such as grading, paving and structures into a number of individual contracts. It is contemplated that grade separation and drainage structures will be included in grading operations so as to afford the grading contractors maximum control of their operations. It is also planned that, where conditions will permit, grading and paving operations will also be combined under one contract. Approximately eighteen con-

(*Continued on page* 89)



★ Route of 100-mile Philadelphia Extension of Pennsylvania Turnpike

★ General view of the outfit that hung up the fast yardages

5779 Ft. of Concrete Per Day

How Arute Bros. placed 8" x 12' concrete slab at 5200-5800 ft. clip on U.S. 20 in Upstate New York last year

THE proper kind of equipment, and plenty of it, a capable crew of workmen, plus adequate planning and the right amount of know-how are all needed in these days of big paving contracts if completion dates are to be met. Arute Brothers of New Britain, Connecticut, combined those essential ingredients in correct proportions to turn out record-breaking achievements in the completion of their $2,673,725 contract for the reconstruction of 12.69 miles of four-lane divided highway on US Route 20, between Morrisville and Cazenovia in New York State.

The New York state department of public works, for whom Arute Brothers built that important highway link, recently announced that a probable new one-day record for construction of reinforced concrete pavement was established on June 1, 1948, when a total of 5,779 lin. ft. of pavement, 12 ft. wide and 8 in. thick, was placed on that project. Examination of progress reports on the Morrisville-Cazenovia job also indicates that the Arute crew had another high run of 5,502 feet on May 20.

Some Day's Work!

Contract items involved in the record day's work, and quantities of each, were: preparing fine grade, 7705 sq. yd.; Portland cement, 2740 bbl.; pavement metal reinforcement, 7705 sq. yd.; linear feet of transverse joint, 770 ft.; concrete pavement, 1712.3 cu. yd. These items at the contract prices amounted to $27,842.75. Expressed in terms of railroad cars, the materials would require approximately 72 cars, a rather sizable volume.

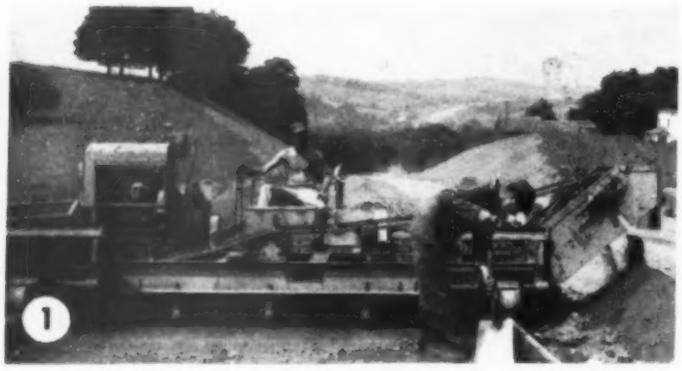
Nor were these the only instances of major accomplishment on the construction of that highway. Records of the department reveal that in the period from June 23 through July 13, 1947, the contractor moved 200,000 cu. yd. of unclassified excavation. This grading, in addition to the other work items completed in that period, amounted to $335,456—equivalent to a good-sized prewar contract.

Good Equipment Outfit

Obviously such accomplishments could not have been recorded without proper equipment of all kinds and in

★ Two Koehring 34-E dual-drum pavers served the Arute job

Step by Step Scenes on Arute's U S 20 Job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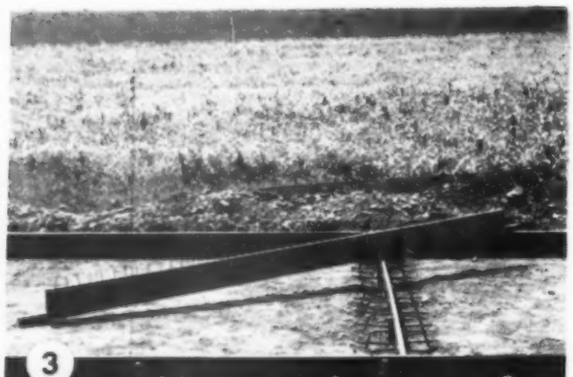
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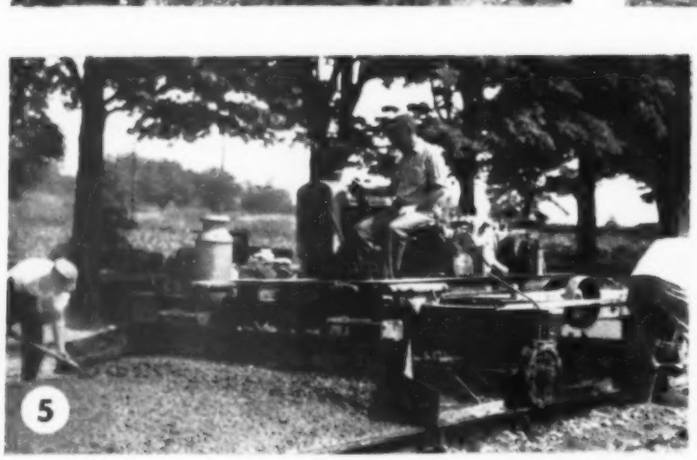
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★ **BEFORE** relocation and double-tracking US 20 in upstate New York. Old pavement worn, winding, steep; its inadequate width slowed up and endangered traffic

★ **AFTER** reconstruction—a reminder of the design advancement that has taken place since the 20's. The new road can handle three to four times the traffic, safely and speedily

considerable quantity as well. Of equal importance was the planning and management of the operations, both before and during the life of the project. As to paving operations, the contractor made certain that materials in quantity would be forthcoming as planned and needed. Equipment likewise was made available and on site. Over 14,000 lin. ft. of forms were used, enabling the form setters to be, at all times, well in advance of the actual paving operation. Such arrangement also permitted fine grading several hundred feet ahead of the concrete mixers. As the pavers worked outside of the forms, no re-grading, rolling, tamping, etc., were necessary, and furthermore, the transverse joints could also be placed well in advance of the point of actual paving. Another aid in speeding up the work was in the use of water trucks for water supply, rather than the use of pump and pipeline. This method again saved minutes in hose changes, delays, etc.—all adding to the goal of production.

While these were all contributing factors to high production, the key to the actual large volumes of concrete was in the use of two new 34-E dual-drum mixers working in tandem.

★ Watching an entrainment test on US 20 job: F. T. Kirchwing, Jr., inspector; L. E. Andrews, Portland Cement Association; A. T. Madison, assistant to construction engineer Utica District; L. P. Crumb, Jr., engineer in charge bridge construction on job; John Hall, Portland Cement Association; A. E. Stewart, district construction engineer; H. H. Glosser, Sr., maintenance; T. F. Maier, in charge of project; John Mamott, assistant to project engineer; V. N. Serio, Jr., plant inspector

★ Note "fins" built on top and sides of concrete box, provided to key structure to overlying fill slope along portion having a steep gradient. (Right): placing stones for porous backfill next to culvert walls

Scenes on Opposite Page

1. Buckeye power subgrader at work
2. Subgrade preparation and rolling (Austin roller) were done well ahead, aided by 14,000 lin. ft. of forms.
3. Type of cross joint assembly used
4. Strike-off machines, before and after
5. placement of mesh reinforcement; latter machine, a Blaw-Knox
6. Longitudinal float finisher; Koehring
7. Membrane application (Hunt)
8. A pair of form pin pullers also saved labor

At the beginning of paving operations, one mixer placed the concrete to the level of the mesh, or approximately 2/3 of the volume, and the mixer following placed the remaining third. As this arrangement did not utilize the full output of the second mixer, the management decided to make a change to increase production. This was accomplished by starting both mixers simultaneously 75 or 80 ft. apart; the front mixer placing only the lower 2/3 as formerly, and the second mixer the concrete full depth. As soon as the rear mixer caught up with the one ahead, the latter would again move forward and the rear mixer repeat as above. In this way, maximum use was made of the second mixer with resultant increase in production.

To cope with such a large volume of concrete and necessary finishing, ut-

★ Over 100,000 cu. yd. of unclassified material consisted of hard shale. Bucyrus-Erie 1¼ and 2-yd. shovels moved this tough stuff into Euclids

★ Trimming fill slopes with a pair of dozers

★ A truck crane (Lorain with Owen bucket) proved OK for culvert trenches

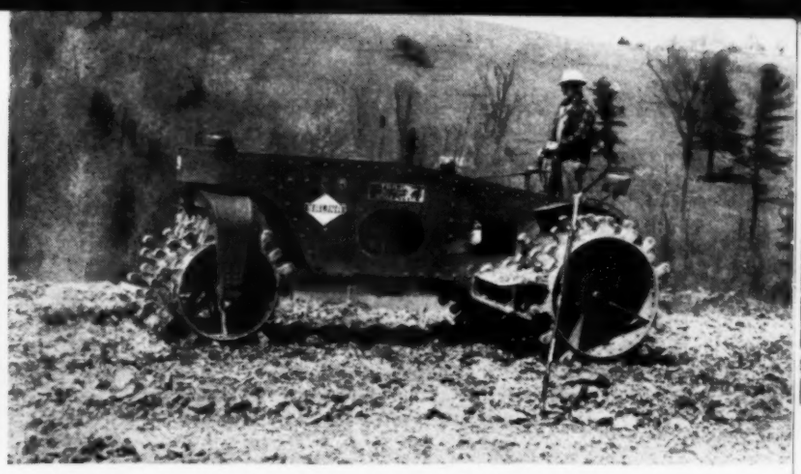
★ Stone-filled drain trenches, with 6-in. paper covered vitrified tile, were placed extensively alongside ditches

★ Trenches for side drains were dug by a pull-shovel assisted by blasting where the shale was too tight

★ Two Allis-Chalmers HD-14's with Buckeye dozers served as pushers for a fleet of eight pans

★ Mack 10 wheelers hauled much of the 90,000 tons of gravel for the 6-in. porous blanket specified under the concrete pavement

★ Quickway pull-shovel on sewer subcontract through a community along the project



★ A Trojan tamper with three drums was used in the Arute outfit

most use of mechanical equipment was, of course, made; e.g., strike-off for metal reinforcement, leveling and distributing concrete above the mesh, transverse screeds, longitudinal floating equipment, as well as the application of bituminous cure by mechanical means.

Rain Hampered Grading

This contract was awarded to the Arute Brothers late in December, 1946. Due to severe winter weather conditions and heavy spring rains, work could not be started until late in April, 1947, and then not under very favorable conditions. The contract was somewhat larger than those customarily let in the past, as it comprised 12.69 miles of four 12-ft. lanes separated by a median strip of varying width throughout, with the exception of the termini and through the villages of Nelson and Morrisville. In those communities two 8-ft. strips and curb were added for parking, making a total width of 64 ft. of pavement.

1,300,000 Cu. Yd.

That was Arute's total for the 12½ miles. The outfit employed, which was greatly hampered by the wet summer of '47, included seven D8 Caterpillars with LeTourneau scrapers; one Allis-Chalmers HD-14 tractor with Gar Wood scraper; two HD-14's with Buckeye dozers; one International tractor with Bucyrus-Erie dozer and sheepsfoot; and another Int. tractor with sheepsfoot; a 1½ and a 2-yd. Bucyrus-Erie shovel and a 2½-yd. Osgood shovel working with eleven Euclid wagons; two ¾-yd. BE units as pullshovels or clamshell cranes; several Ford and Mack trucks; a Lorain truck crane.

★ A 2-yd. shovel is hefty, but the Arute method is to just load it onto a 26-tired flat-bed trailer

★ International farm tractor with light dozer used by subcontractor on sewer backfill through urban section

Among the major items in the contract were: unclassified excavation, 1,310,000 cu. yds.; R. O. bank gravel, 85,900 cu. yds.; concrete pavement, 81,043 cu. yd.; portland, natural, and air-entrained cement, 143,100 bbl.; metal reinforcement, 364,950 sq. yd. These five items amounted to $1,909,882 of the 58 items in the $2,673,725 contract.

The Morrisville-Cazenovia project is located in Madison County, a part of District No. 2 of the New York state department of public works, and was completed under the direction of Lacy Ketchum, district engineer with headquarters in Utica, N. Y. Thomas F. Maier, of Mr. Ketchum's staff, was resident engineer in direct charge of the project. Jack Arute, president of Arute Brothers, Inc., was in charge for his firm. He was ably assisted by E. M. Norberg throughout the job, and by James J. Arute during the heavy grading operations in 1947.

Coming Meetings

Southeastern Assn. of State Highway Officials, annual meeting; Edgewater Park, Mississippi; Nov. 3-5.

Highway Research Board, annual convention; Washington, D.C.; Dec. 6-10.

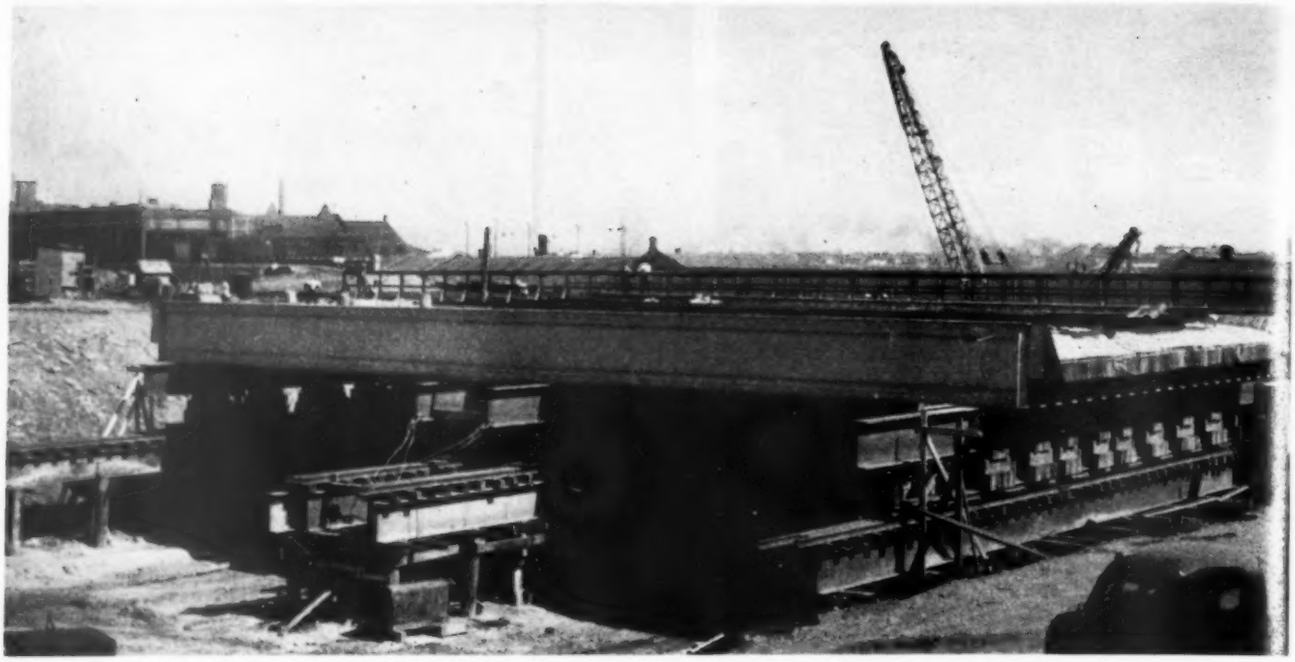
Associated Equipment Distributors, annual convention; Chicago; Stevens Hotel; Jan. 16-20.

National Crushed Stone Assn., 32nd annual convention; New York; Hotel New Yorker; Feb. 7-9.

National Ready Mixed Concrete Assn., 19th annual convention; New York; Hotel New Yorker; Feb. 14-18.

National Sand and Gravel Assn., 33rd annual convention; New York; Hotel New Yorker; Feb. 14-18.

Associated General Contractors of America, Inc.; annual convention, Waldorf Astoria Hotel, New York City, Feb. 28-March 3.



★Here she is, Saturday afternoon, ready for the midnight move. Note lines of rollers and blocking at either end and two mid-point, the latter straddling the center-pier position

1150 TON BRIDGE DECK

Rolled Into Position

- **Two-span railway bridge deck unit—complete with rails and ballast for 4 tracks—moved 58 ft. laterally in 2 hours' time with single small crane**
- **Part of new Fort-Jefferson Connection involved in first $28,000,000 section of Detroit's new John C. Lodge Expressway, now under construction**

By H. A. Shuptrine

Engineer of Bridges and Structures,
Wayne County Road Commission, Detroit

THE workers reported for duty 8:00 p.m. Saturday night, September 11. By daylight they had torn out five panels of trestle serving three rail tracks and a yard lead and rolled a 2,300,000-lb. steel bridge unit, complete with ballast and rails in place thereon, laterally 58 ft. into final position under the same tracks.

The crew was that of Jutton-Kelly, Detroit contractor, aided by railroaders serving the interests of the several lines (Pennsy, C&O, Wabash) which use the freight facilities and the Fort Street Union Passenger Depot adjacent to downtown Detroit. The bridge, which will span a new street underpass, is located in a "hot spot" at the throat of the passenger and freight yards. Traffic could not be interrupted, nor could tracks be shifted without prohibitive expense.

After studying various schemes, it was decided to drive a temporary trestle into the high railway embankment at the underpass site, erect the bridge deck on falsework alongside, and at the same time excavate for the underpass (thus exposing much of the temporary trestle) and construct concrete abutments and mid-pier for the bridge. The bridge span was then to be rolled laterally into final position, on false work extending under the temporary trestle.

This scheme was carried to a successful outcome on the Saturday night mentioned, after a summer spent in preparation.

The trestle was constructed first and consisted of bents spaced to clear the positions of both the concrete abutments and piers and also the extended falsework for rolling the new deck. Piles were driven between train movements, with no untoward difficulties except the encountering of large stones, pieces of old masonry and other obstacles buried in the railway embankment fill. Somes piles had been driven badly out of line for this

Progress on Expressway in American Cities
3—DETROIT *(See this article and also progress summary on the next page)*

reason and some had to be replaced by timber posts on sills.

Specially Designed Trestle

The temporary trestle deck consisted of I-beams framed together into units each readily liftable with a heavy crawler crane spotted on the ground below. When the Saturday night zero-hour arrived, the crewmen simply yanked up the rails after unbolting the nearest splices and pulling track spikes, took out the ties, and removed the beam sections. The blocking and capping down to the piles were yanked off in units. The two tracks farthest from the new deck were taken out first; then, after the last train passed over about 1:30 a.m., the last track came out and the rolling job was ready to begin at about 4:10 a.m.

Design of Deck

The permanent deck structure consists of continuous rolled beams, with plate floor, mastic waterproofing, and ballast, flanked on each side by built-up fascia girders. These two outside girders, which are not parallel, are 98 and 100 ft. long, respectively, end to end. The deck is 56 ft. wide at one end and 74 ft. at the other. The structure complete with ballast, ties and rails, ready for rolling into place weighed about 1150 tons.

No special design features of deck design were required because of the moving, but diaphragm plates between floor beams were bolted and riveting delayed until after the move when a check could be made to be sure each beam was properly seated in final position. The deck's four tracks were placed complete with three switches. Rails were cut to exact length to fit splices in the existing track. Rails were left unspiked near each end of the deck and raised to a level several inches above final position, so that any rails would clear above the joints after the move, in event they were too long to slip into butt position.

Roller Support Details

The deck was erected on four lines of falsework—one at each end in a line to clear the face of the abutments and two at the middle straddling the center pier. Each line included a line of roller nests. Roller nests included 2-in. diameters rolls 15 in. long. Rollers were drilled in ends and fitted with capscrews and with side plates to form sections approximately 6 ft. long. Roller assemblies were designed thus to insure against cantering and throwing the bridge out of line during the move.

The rollers were supported on five parallel 110-lb. railroad rails, in turn carried on a 140-lb. 28-in. I-beam resting on the pile caps. Alongside the abutments and pier, frame bents supported on the footings were used as a continuation of the pile falsework.

Above each line of rollers were five 110-lb. rails, head down. Then came heavy blocking, with jacks set at intervals in open spaces between the blocking, the jacks bedding on ¾-in. steel plates. Above the jacks and supported on the blocking was a 140-lb. 28-in. I-beam directly in contact with the floor beams of the bridge deck.

Hydraulic jacks, 300 and 500 ton capacity, were used, set with pistons 4½ in. up. The plan was to first raise the pistons to release and remove the blocking and then to bring the deck to rest on its bearing plates. Five jacks were spaced along each outer line and four jacks along each of the two middle lines. The jacks were hooked up in groups of two,

★ Bridge in final position and carrying traffic

Construction of Detroit's John C. Lodge and Edsel Ford Expressways Progressing on Schedule

As with Expressways in other cities, those for Detroit have required several years of planning and effort to arrive at financing arrangements, obtain right-of-way, overcome legal obstacles, and begin work on structures.

The first expressways being undertaken are the John C. Lodge Expressway and the Edsel Ford Expressway, both of which are depressed, limited access highways. Each provides a 6 lane divided express roadway. The Lodge is being designed and built by the Wayne County road commission as agent for the Michigan state highway department. The Ford expressway work including the Ford-Lodge interchange is directly handled by the state department under highway commissioner Charles M. Ziegler.

The John C. Lodge Expressway skirts the west side of the business district and extends northerly from the Detroit River to an interchange with the Edsel Ford Expressway and thence northerly and northwesterly to enter the Schoolcraft Superhighway in Northwest Detroit, a total length of approximately 11 miles. Only the southerly (downtown) section, 3½ miles long, to a point beyond the interchange, is covered by present arrangements.

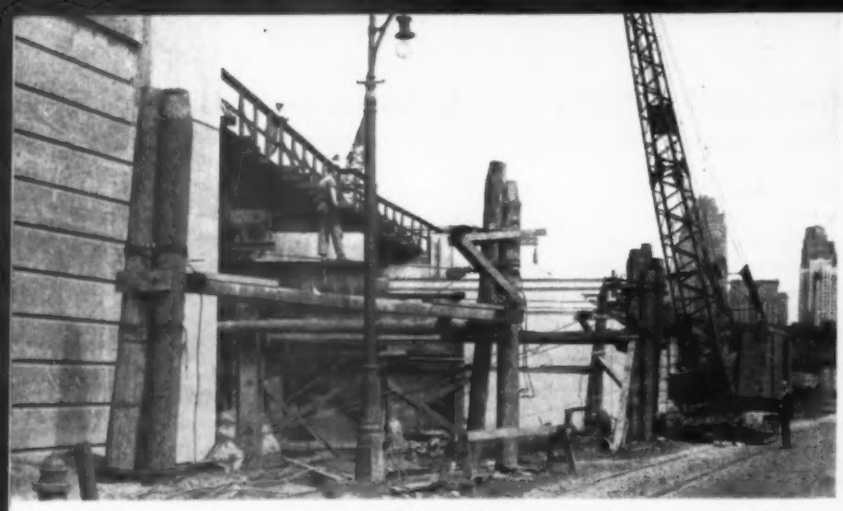
The Edsel Ford Expressway is an east-west (crosstown) expressway leading from the famed Willow Run and Detroit Industrial Expressway system at the westerly limits of Detroit and crossing the city for a distance of about 16 miles. Only the westerly section, 5½ miles long, extending to and somewhat beyond the elaborate interchange with the John C. Lodge Expressway is involved in the immediate undertakings.

To date, approximately $7,700,000 has been expended for right-of-way against a probable total of $8,300,000 for the section of the John C. Lodge Expressway now under construction. Construction has been programmed and financed to a total of over $5,000,000, of which approximately $3,350,000 is covered by contracts let or completed, including the following major elements:

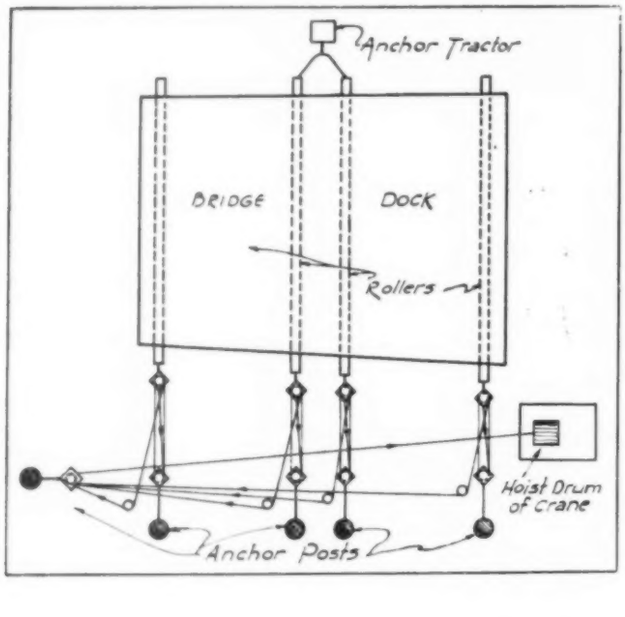
Milwaukee Avenue bridge	$ 243,000
Forest Avenue bridge	375,000
NYC and GTW railroad grade separation and related work	1,115,000
Fort-Jefferson connection	745,000
48" Watermain relocation in Fort street	132,000
Miscellaneous utility relocations	182,000
Advance purchase of watermain materials	177,000
Six pumphouses	200,000
Penna. R.R. pool car platform building	139,000
	$3,308,000

Approximately 75 buildings have been demolished. Evictions and demolition are avoided until required by construction.

The Edsel Ford Expressway has progressed at somewhat the same rate.



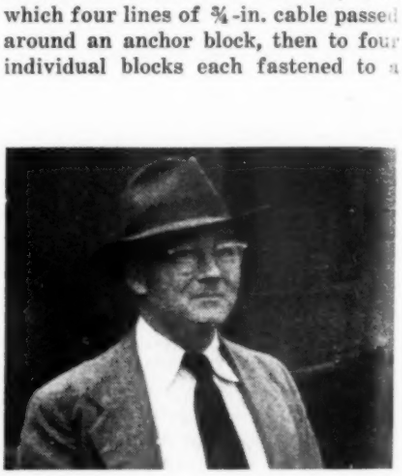
★ Photos taken during one of the preliminary rolling-in tryouts. (Left): Complete hook-up, as shown also in drawing below; nearest pile cluster is anchorage for the final sheave, located near ground. (Right): Posts for the two center-span pulling lines



★ Scheme of ropes and blocking used in moving the bridge. The rope passed twice around the pair of sheaves in each pulling line

forward progress once rolling got under way. By slight change of position the dozer could also serve to tack the deck slightly to right or left, to correct any deviation tendencies that developed during the travel. No occasion was found to use the bulldozer for either purpose.

The cable system for pulling the deck into place was simple and effective. A single heavy cable from the crane hoist drum led to a clevis, from which four lines of ¾-in. cable passed around an anchor block, then to four individual blocks each fastened to a

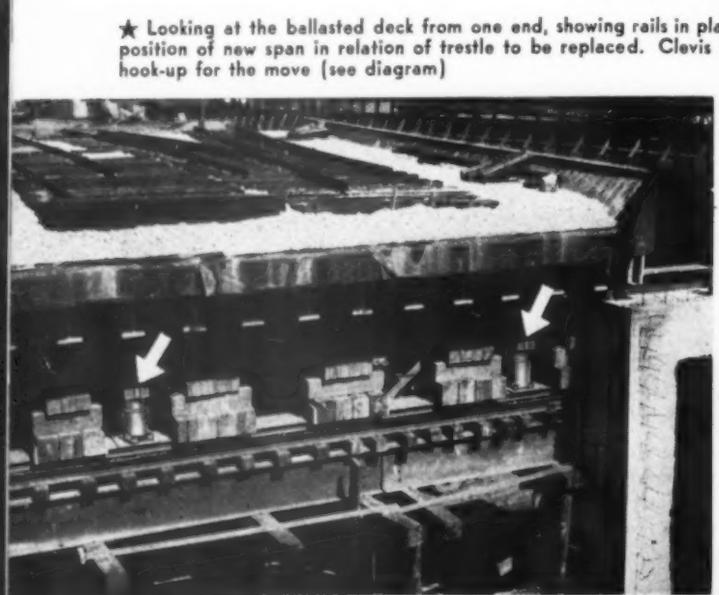


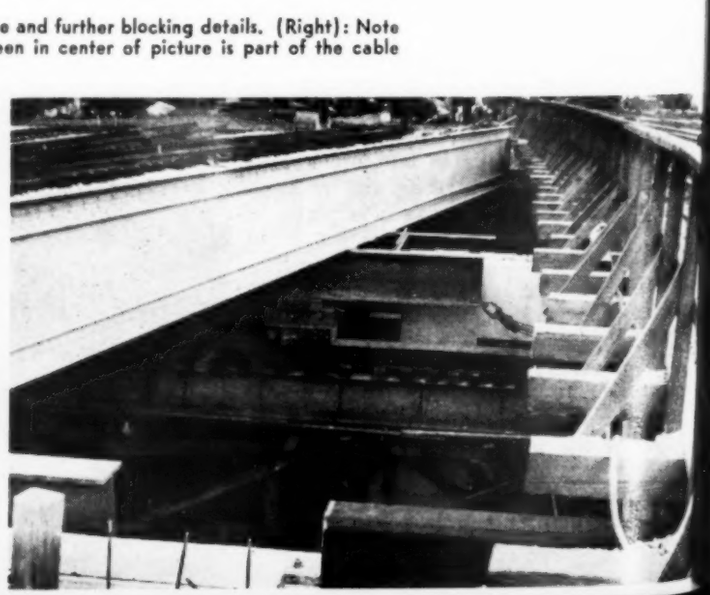
★ H. A. Shuptrine, bridge engineer, in charge for Wayne County

three or four hand-operated hoist units, mounted on platforms up by the jacks. These platforms were also used by inspectors to watch chalk lines and check progress, longitudinal and lateral, as rolling progressed.

The actual moving was performed by a single ¾-yd. crane, selected from several cranes on the project as having the largest hoist drum capacity. A cable sling was fastened by clevises to the rear ends of the two middle lines of upper falsework girders. This cable was attached in turn to winch line on a bulldozer, which served as a deadman or rear anchor to control the

★ Looking at the ballasted deck from one end, showing rails in place and further blocking details. (Right): Note position of new span in relation of trestle to be replaced. Clevis seen in center of picture is part of the cable hook-up for the move (see diagram)





pile cluster at the head of a roller line. From these four blocks each line passed twice around sheave blocks clevised to the ends of the falsework I-beams, the lines finally being anchored at clevises in these blocks. (See the accompanying diagram).

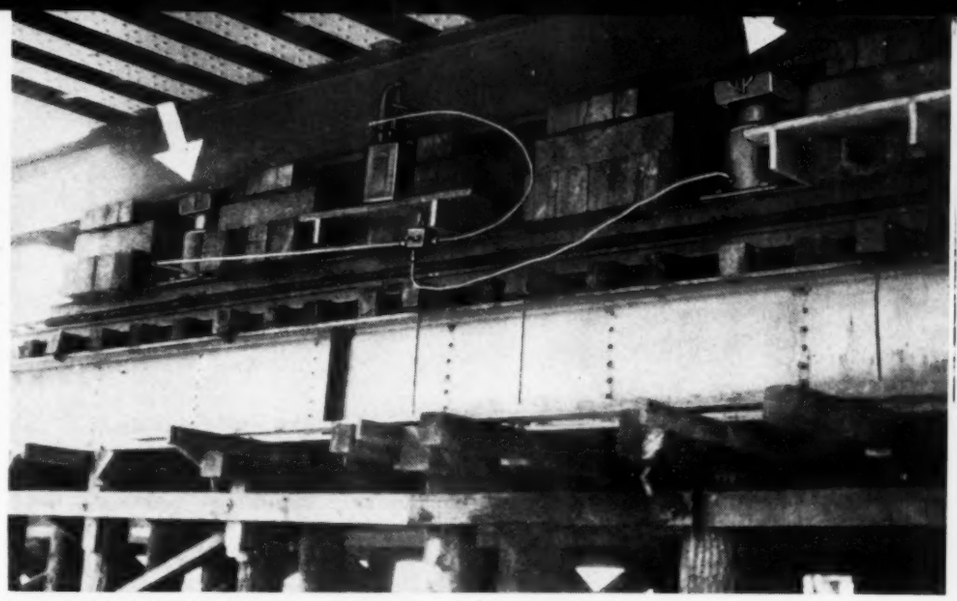
All cable was either brand new or little used. Cable of the preformed type was employed, for flexibility and insurance against kinking of this rather elaborate rope system or fouling up on the drum. Rope was given a thorough preliminary stretching by making short test moves, these moves bringing the deck as close as possible and reducing the final moving distance. Considerable time and labor were involved in repeatedly adjusting the four ropes so that an equal pull would be exerted.

Finally, when the temporary trestle had been torn out and the signal given to make the final 58-ft. move, the distance was traversed in one continuous slow rate of travel. Transitmen sighted on candles to check the progress, but chief reliance was placed on a continuous check of end clearances to the backwalls and of remaining travel distance. Batteries of truck-mounted flood lights were trained on the work throughout the job.

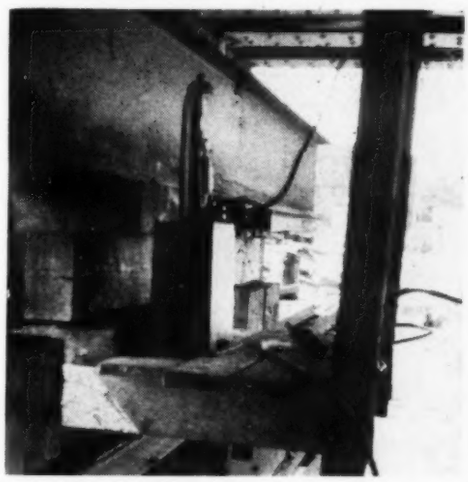
Two minor hold ups occurred in the rolling in. Near the end of the travel it became necessary to burn off a small corner of the bottom flange of one end of the fascia girder when it began to foul the back wall. At that time, a small 20-ton jack, in view of the elasticity of the falsework, exerted sufficient pressure to correct the slight skew in alignment.

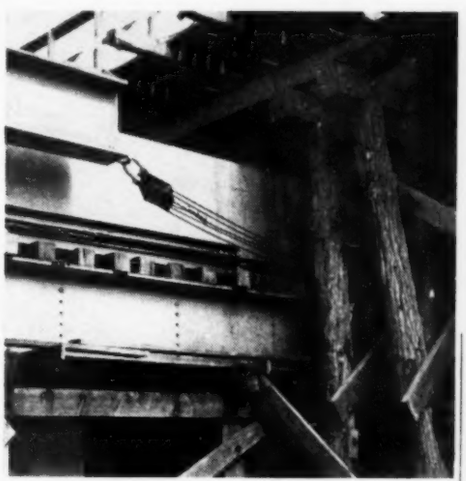
Later, one of the jacks was fouled by some of the old trestle under-structure, necessitating slight repairs. The problem of engaging anchor bolts was avoided, the anchor bolts extending only through the heavy masonry plates already in place on the bridge seats. After the bridge was landed, the bearing plates of the beams were held in proper position on the masonry plates by strips welded to the masonry plates at appropriate locations.

The bridge finally landed on all bearings within ½ in. of correct position in all directions and with all beams properly seated at 6:00 a.m. Remaining waterproofing and backfilling behind abutments, and fitting up of tracks were then completed and the first train passed over at 8:45 a.m.



★ Typical details of blocking. Arrows point to jacks in position, hooked up to the hydraulic pump and ready for operation





★ (Left): Another view of a jack and pump assembly, jacks being hidden behind blocking here. (Right): Concrete center pier ready for the bridge, and temporary trestle just before demolition

★ The underpass was excavated with a Bay City dragline with Page bucket, aided under the trestle by pneumatic spades and hand shovels until sufficient room was made for a small dozer and a front-end loader to get under

★ Heavy expenditure in water line relocation was required as part of the Fort-Jefferson Connection project. Lock-Joint pressure pipe being installed by Waterway Const. Co. along busy Fort street. Close timing of truck arrivals was required, due to street-side location of pipe line and requirement that sand covering follow closely behind the setting

★ Concrete retaining wall on the rear side of the trestle was demolished with an 8000-lb. ball, using a Bay City crane which also aided in trestle demolition later along with two Manitowoc cranes

★ A Link Belt Speeder loader and a D7 Caterpillar with Caterpillar hydraulic dozer, busy taking the last of the dirt out to where the dragline could put it into trucks

Acknowledgments

The foregoing operation was performed as part of the contract of Jutton-Kelly, Detroit, for the new Fort-Jefferson Connection and its underpass, which replaces Sixth Street which must be closed for construction of the new John C. Lodge Expressway. The first of several contracts in the area, this bridge will be part of an elaborate scheme to carry the Expressway under railway passenger terminal and yard tracks.

The John C. Lodge Expressway is being designed and built by the Wayne County Road Commission, Leroy Smith, County Highway Engineer, as agent for the Michigan State Highway Department. Harry A. Shuptrine, Engineer of Bridges and Structures with the Wayne County Commission, was in general charge of the design and construction. M. J. Huber, District Engineer in charge of Lodge Expressway work, supervised construction in cooperation with O. E. Hager, Engineer of Bridges and Structures, C&O Railway, whose staff checked and approved the plans and cooperated in the phases of construction and design.

H. C. Whitehurst Is Dead

Capt. Herbert C. Whitehurst, 61, head of the highway department of the District of Columbia, died Sept. 1 of a heart attack.

Capt. Whitehurst was graduated from Virginia Polytechnical Institute in 1906 and until World War I worked for contractors. During the war he served as a combat engineer officer. He remained in the army for a time, during which he was head of the construction division at Wilson Dam, Alabama. While still in the army he was assigned to the District Engineer-Commissioner's office in Washington, D.C. This was in 1926. He resigned in 1929 to enter private practice.Shortly thereafter he was called back by the Commissioners in the District of Columbia, as chief engineer and coordinator. Later the job was expanded and he received the title of director of highways for the District of Columbia. During World War II, he served as head of the District Department of Civilian Defense, and commander of the city's civilian defense corps. He continued to supervise the highway department.

Capt. Whitehurst was the first president of the city officials division, now municipal division, of the American Road Builders' Association. He was elected treasurer of this association in 1940 and was serving in that office at the time of his death. He was president of ARBA in 1935-1936.

●

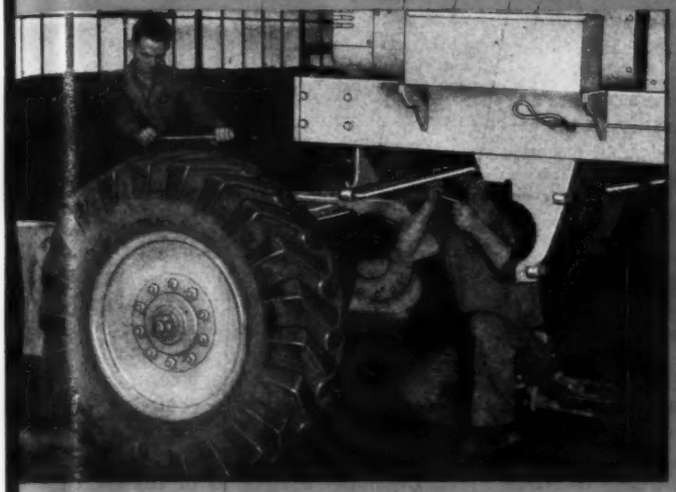
Indiana Has 5,000 Equipment Units—The Equipment Department of the Indiana State Highway Commission through its Central garage and subdistrict garages maintains over 5,000 pieces of equipment. A survey shows that 56% of the present equipment was purchased prior to 1940. Much of this was in 1932-33.

●

Tire mountings and engines give the least trouble, and driving axle, rear springs and clutch give the most frequent trouble, according to a survey recently made among owners of trucks in the concrete ready-mix industry. A preponderance of rear items showed up on the trouble list.

REPLACE REAR AXLE—
2 TO 4 HOURS (1 MAN)

OVERHAUL CLUTCH—
4 HOURS OR LESS (1 MAN)



REMOVE TRANSMISSION—
2½ HOURS OR LESS (2 MEN)

REMOVE ENGINE—
3 HOURS OR LESS (2 MEN)

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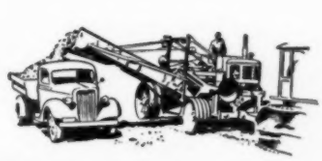


MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS

Contractor and Aviation Group Meet in Seattle

NASHO-AGC Joint Cooperative Committee take action to cut airport construction costs, speed contract approval, and expedite payment to contractors

IF the contractor were paid more promptly for work completed on federal-aid airport construction projects, rather than having payments delayed for some time as now occurs on many jobs, an appreciable construction cost saving could be obtained, it was concluded by the Joint Cooperative Committee of the National Association of State Aviation Officials and the Associated General Contractors of America, Inc., at a meeting July 20 at Seattle, Wash. Based on careful discussion of this subject, the Committee passed a resolution that calls for the insertion of such provisions in all future airport contracts.

Costs could be further cut if contracts were awarded more promptly once bids are opened, if more long-range planning is done, and if the work of acquiring the necessary land for the projects can be simplified, the Committee also found. Steps were taken by the Committee that will provide help on all of these matters.

30-Day Payment Urged

Those in attendance included state aviation officials, the contractors, Civil Aeronautics Administration officials and consulting engineers. They all strongly urged that the contractor be paid within 30 days after the final estimate on a project is submitted, and urged that the Civil Aeronautics Administration insist that local sponsors make such an arrangement a part of their contracts with the builders. The Committee further recommends that the partial payments be handled much more promptly, as the contractor was entitled to this action and that appreciable benefits to all parties would result.

Discussion of the delay that has occurred between the time bids are opened and the contract is awarded revealed a delay of as much as 90 days in some cases. As a result, the contractor's equipment was idle for a longer period than was anticipated, payment to the consulting and design engineers was delayed, and the picture as to the delivery of materials and supplies was confused.

CAA officials pointed out that most advertisements for bids for federal-aid airport projects now include provision that permits the contractor to withdraw his bid 30 days after the opening, if the project is not awarded. However, they stressed that this was no excuse for the long time required by some cities and other sponsors to award the contract and to notify the contractor to proceed with actual construction. Most of those present reported that in the areas where they had been working, the time delay has been cut appreciably in recent months.

Award More Quickly

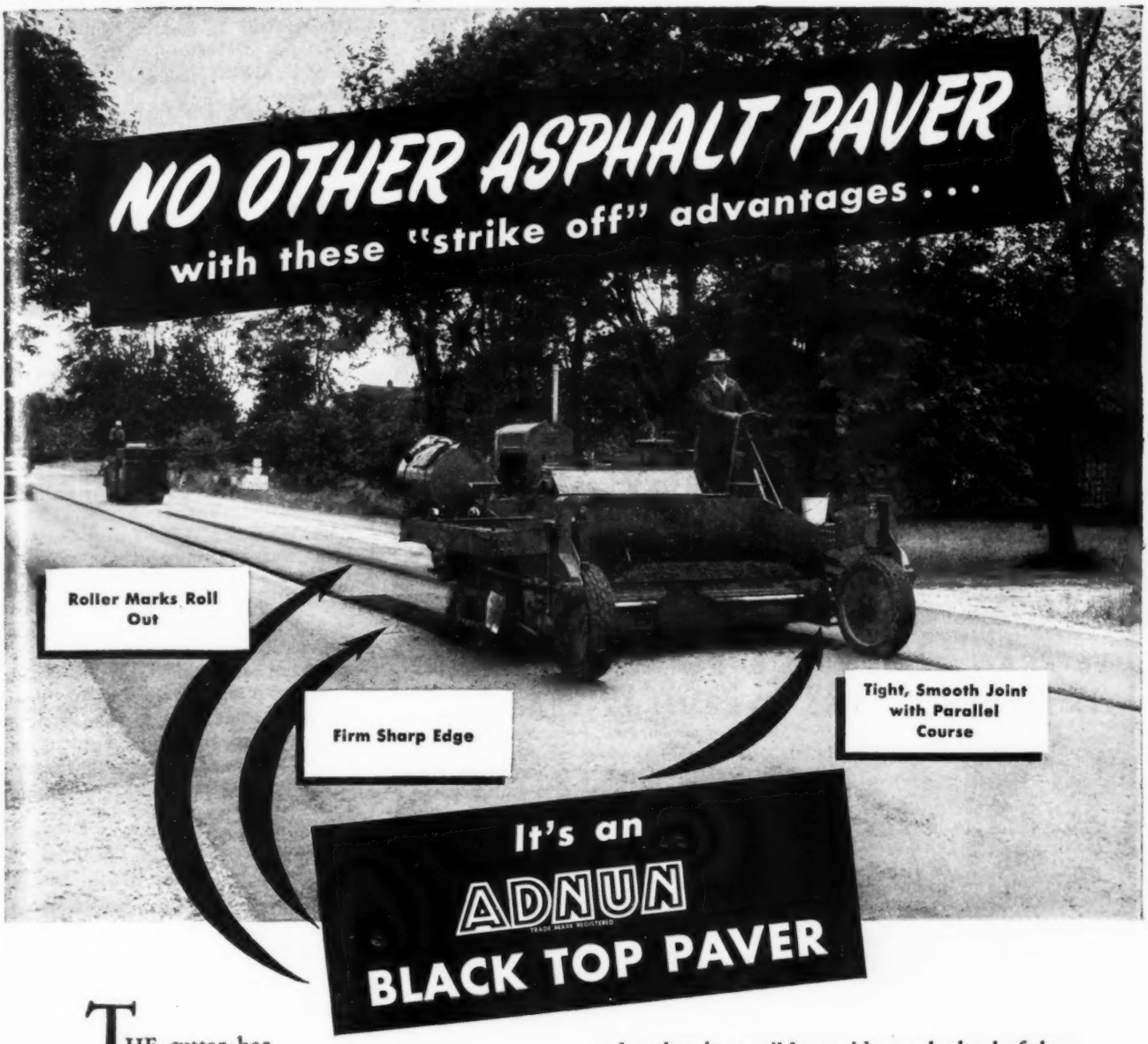
One possible means of cutting the time between the opening of bids and the actual award of contracts would be an arrangement whereby the CAA regional offices could increase the federal-aid allotment for a given project more quickly than is now possible. Such an arrangement is now under advisement by the CAA and early improvement is expected. Use of a rotating fund as now used on highway work by some states was suggested as one possible method of solving this problem.

Discussion of more prompt payment to the contractor revealed that many state highway departments now require final payment within 30 days after the final estimate is received. Such an arrangement, which was declared simply good business by all those present, has worked satisfactorily in most states and the airport program was classified as being no different from federal-aid highway construction.

Under the general provisions of the new construction specification published in July by the CAA, it is recommended to the sponsors that they require all bidders to submit a financial statement, dated within 30 days of the bid opening date. The Committee declared this provision illogical, since it is impossible for the contractor to prepare a financial statement that much up to date.

Instead of this arrangement, it was recommended that the contractor be requested to submit a certified statement as to his financial condition as of December 31st or as of the end of the fiscal year on which he operates. In all cases, the statement was to be

"HMM — YOUR MACHINERY LOOKS OKAY TO ME"



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The special bevel tooth design provides an initial compression. Overlapping action at the ends of the cutter bar carries the material up and compacts it against parallel course or curb, making a tight joint. The whole cutter bar can be raised hydraulically at either or both ends. A quick lift provides for emergencies. Tilt control makes it possible to ride on the heel of the blade. A fine adjustment cares for banked or wedge courses and a simple control device assures any amount of adjustment for crown.

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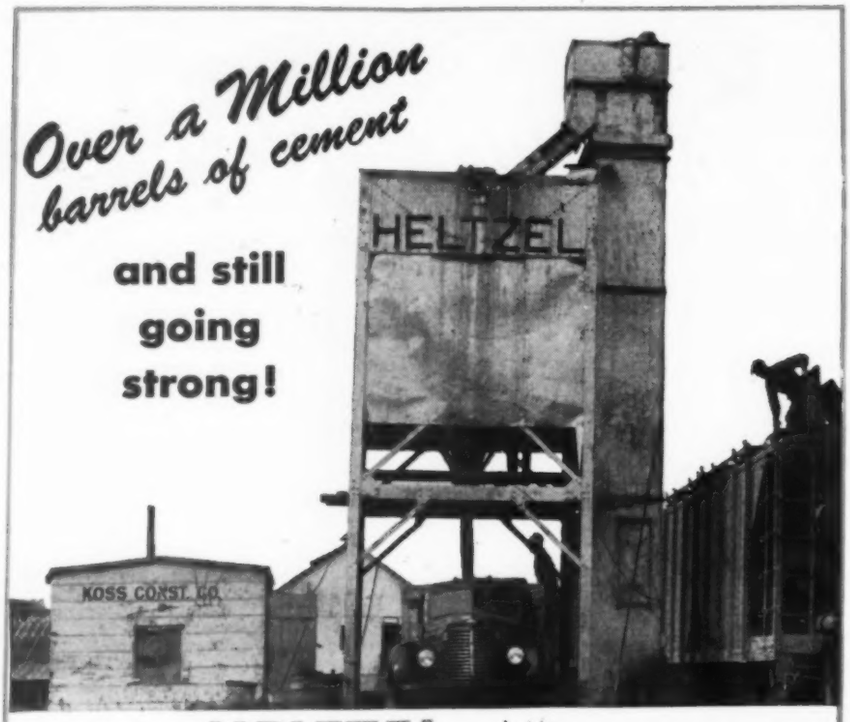

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Richard B. Koss
Vice President

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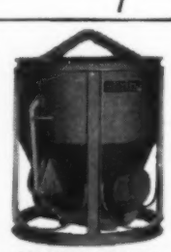
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effective for 15 months, which would allow the contractor 3 months of a new year before he had to submit a new statement.

An up-to-date statement by the contractor as to the amount of equipment he has available for a given project was considered very important. The Committee plans to continue to urge sponsors of the importance of these statements.

Since the Federal Airport Act was passed some 400 projects requiring a total of $37,000,000 in federal funds and about an equal amount of local money had been awarded, the CAA engineers reported. The rate of the awards has jumped in recent months and during the month of June alone, 40 projects were awarded.

Martin Was Chairman

Dexter C. Martin, director of the South Carolina Aeronautics Commission, was chairman of the meeting. Other state aviation officials present were: William C. Hill, chief engineer of the Oregon State Board of Aeronautics; Joseph P. Adams, director of Aeronautics for the State of Washington and R. L. Nuber, project engineer of aeronautics. A. N. Carter, of AGC, is co-chairman of the committee.

The contractors were represented by: Max C. Harrison, of the Harrison Construction Co., Pittsburgh, Pa.; George C. Koss of the Koss Construction firm of Des Moines, Iowa; Carl W. Erickson and Joe Erickson, both of Erickson Paving Co., Seattle, Washington; C. R. Wilcox, Washington Asphalt Co., Seattle, Washington; E. A. Dalakow of Dalakow-Underseth Engineering and Construction Co., Helena, Mont.; E. B. Hickok, manager of the Seattle Chapter of the A.G.C.; W. H. Landaas, assistant manager of the Mountain Pacific Chapter of the A.G.C.; Clarence W. Todd, manager of the Tacoma Chapter of the A.G.C.; Harry Kirk, manager of the specifications and safety division of the National Office of the A.G.C., and A. N. Carter, manager of the highway division in the National Office.

CAA representatives present were: Richard T. Puckey, superintendent of airports for CAA's Seventh region; George E. Johnson, chief engineer in that same office; Kenneth S. Perry, assistant superintendent of airports for that region; and Everett C. Crites, chief of the CAA's standards coordination division, Washington, D. C.

Also present were: Cecil C. Arnold, consulting engineer of Seattle; J. A. Maierle, Morrison Engineering Co., Helena, Montana; Robert F. Hamilton, Consultant of Pocatello, Idaho; J. W. Arch Bollong of the City of Seattle; and Larry L. Wise, *Engineering News-Record*.

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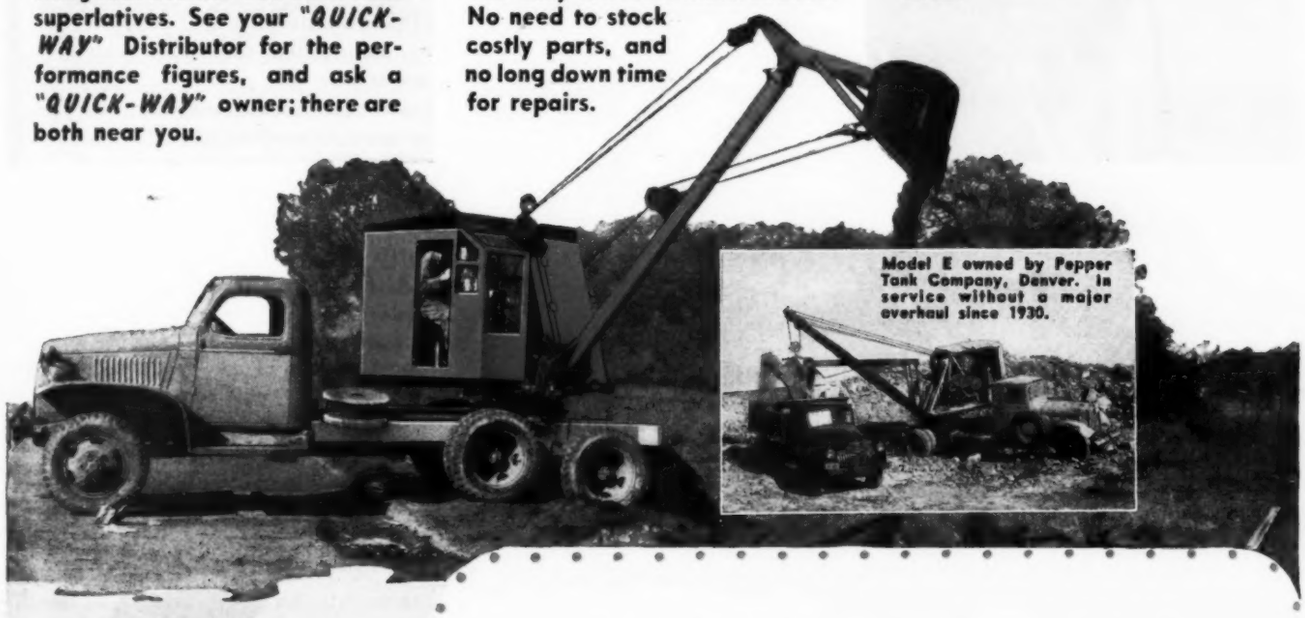

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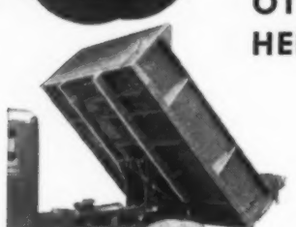

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★ This grader-operated gutter forming "iron" saved money for a contractor in San Bernardino County, Calif.

Special Attachments Form Bituminous Gutters and Curbs

HERE are two pictures showing how contractor George Herz & Co. put down bituminous gutter economically on City Creek Road, near San Bernardino, California. A spreader box, with a notch, is towed along the shoulder, where it leaves a measured windrow. Then a No. 12 Caterpillar grader follows, using its blade and a special gutter-forming extension, to spread the material over the shoulder into the gutter and iron it out to a V-section.

As clearly shown in one photo, the extension consists of a screed under which is welded a shaping iron. By adjusting the height as well as angle of the blade, the operator can exert an ironing effect on the mix. This type of gutter has found increasing favor along with bituminous curb in preventing washing on roads in arid sections of the West. This contractor molds a bituminous curb or dike, where specified, by unbolting the gutter device shown and substituting a similarly attached form, designed to leave the desired curb section formed and compacted.

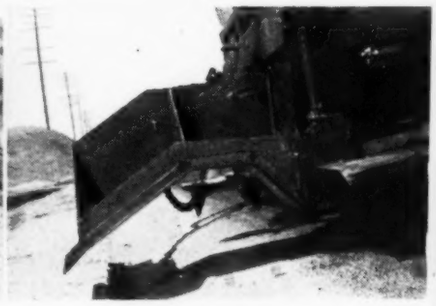
Very effective attachments for a bituminous paver also were developed recently by N. M. Ball Sons, contractor, at the suggestion of A. L. Lamb, resident engineer, for the paving of shoulder dikes, side ditches and back slopes on a recent highway project on U. S. 101 in Santa Barbara County, California.

As described in "California Highways and Public Works," the attachments are of welded construction and are fabricated with sufficient taper to consolidate the plant-mixed surfacing as it is forced under them. Each attachment has a vertical and horizontal half-hinge permitting it to be rapidly fastened in place and to be adjusted to a level position where the slope of the shoulder changes due to super-elevation. The other half-hinge is attached to a special plate that replaces the regular side plate on the finisher. The special plate leaves sufficient opening at the end of the worm to feed the mixture to the attachment. Although these attachments were mounted on a Barber-Greene finisher, it is believed they can be made adaptable to other makes.

The accompanying photographs show the operation of these devices.

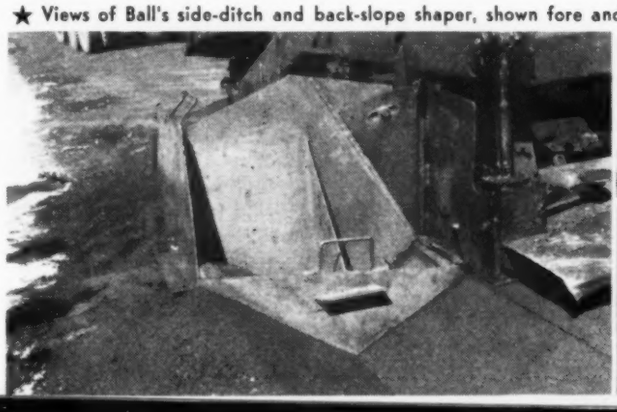
These attachments maintain a fixed relation between pavement grade and adjacent drainage facility. The results were so uniform and pleasing in appearance that the use of these or similar devices is recommended for all such work by the California division of highways.

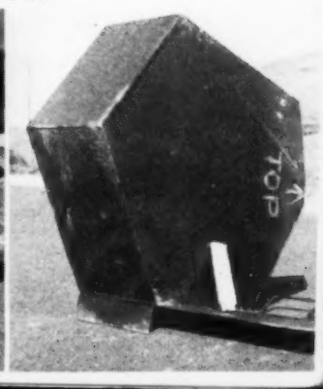
★ As devised by N. M. Ball Sons for work in Santa Barbara County, Calif. Forward and rear views of shoulder dyke shaper in operation



★ Forward and rear view of same shaper, lifted clear

★ Views of Ball's side-ditch and back-slope shaper, shown fore and aft





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The Ultimate Particles

By Halbert P. Gillette

AN article having the above title, by George W. Gray, in *Scientific American*, June, 1948, summarizes facts, theories and conjectures by nuclear researchers. The most recent discovery of importance was the artificial production of mesons early in 1948 by Eugene Gardner and C. M. G. Lattes, using the new cyclotron at the University of California. Hitherto mesons have been produced only by cosmic rays. The mass of the cyclotron meson is about ⅙ that of an atom of hydrogen.

In my article of November, 1947, the theory was advanced that there are two fundamental particles, a negative electron and a positive vitron of double the electron's mass, which form an orbital pair that is a fundamental magnetic system which may be called an elementary magneton. I infer that the neutral atom of hydrogen consists of 616 magnetons arranged along several diameters, with their orbits perpendicular thereto, and at regular distances from the center of the atom. Hence, the force that binds the magnetons to one another is electromagnetism. The repulsive force that prevents collapse of the system is electric. A sketch of two parallel magnetons whose centers of mass are on a straight line perpendicular to their orbits shows that electric repulsion of like charges exceeds electric attraction of unlike charges because like charges are closer together than unlike charges. Such a system is elastic, and its elastic pulsations may cause ether waves. Bohr's leaping-electron theory has no analogue, but elastic pulsation of an electron orbit in a magneton would give like effects.

When 16 atoms o fhydrogen combined to form an atom of oxygen, there was a loss of mass that has been ascribed by Einstein to conversion of mass into radiant energy; but the magneton theory here presented ascribes it to the emission of magnetons. Thus an atom of hydrogen having the mass of 1848 electrons becomes a neutron of mass 1836; and when it emits an electron it becomes a positive proton of mass 1835 in the oxygen atom.

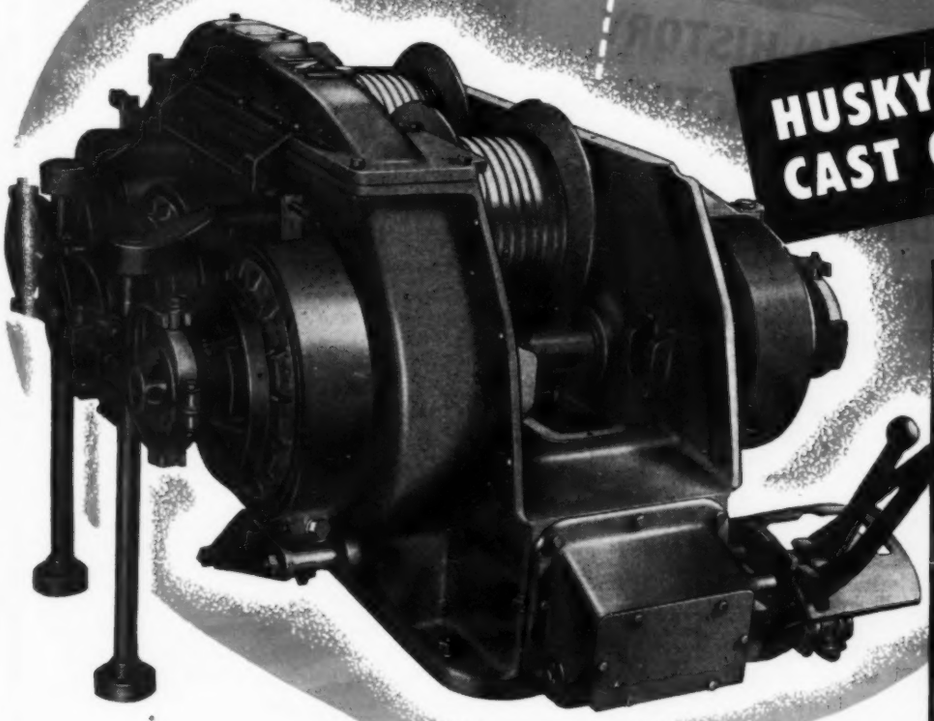
According to this theory all molecules, atoms, protons, neutrons and mesons are crystalline systems. Structural formulas in chemistry are explained as consequences of magnetic attractions that are greatest along certain axes passing through the centers of mass of series of magnetons composed of orbital pairs of electrons and vitrons whose mass ratio is one to two. In my November article it was shown that by this mass ratio, Barnett's "gyromagnetic anomaly" is explained without invoking a hypothetical spin of the electron around its axis.

In the cyclotron and other machines for accelerating charged particles, it has been found that at very high velocities increasingly greater electric impulses are required to produce equal accelerations. This has been regarded as proof of Einstein's theory that mass is a function of velocity. But there is another explanation; namely, that electric pressures are due to ether waves, whence it follows that as the velocity of an accelerated charge increases, the pursuing wave exerts a decreasing pressure. Since the velocity of an ether wave never exceeds that of light in a vacuum, the acceleration due to an ether wave in a cyclotron becomes nil when the charged particle attains the velocity of light.

The positron is a particle having a positive charge equal to the negative charge of an electron. The mass of the positron is supposed to be that of an electron, but I believe it will be found to be double that of an electron, and therefore the same as the vitron which pairs orbitally with an electron in an elementary magneton.

(*Continued on page* 94)

THE "HEART" of Every UNIT



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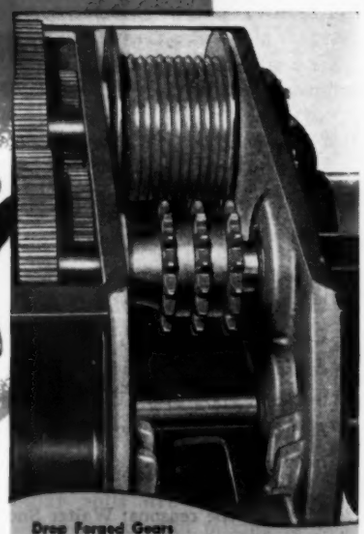

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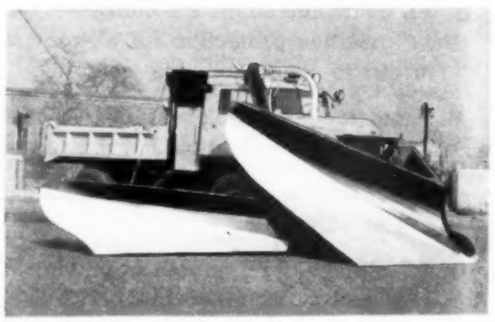

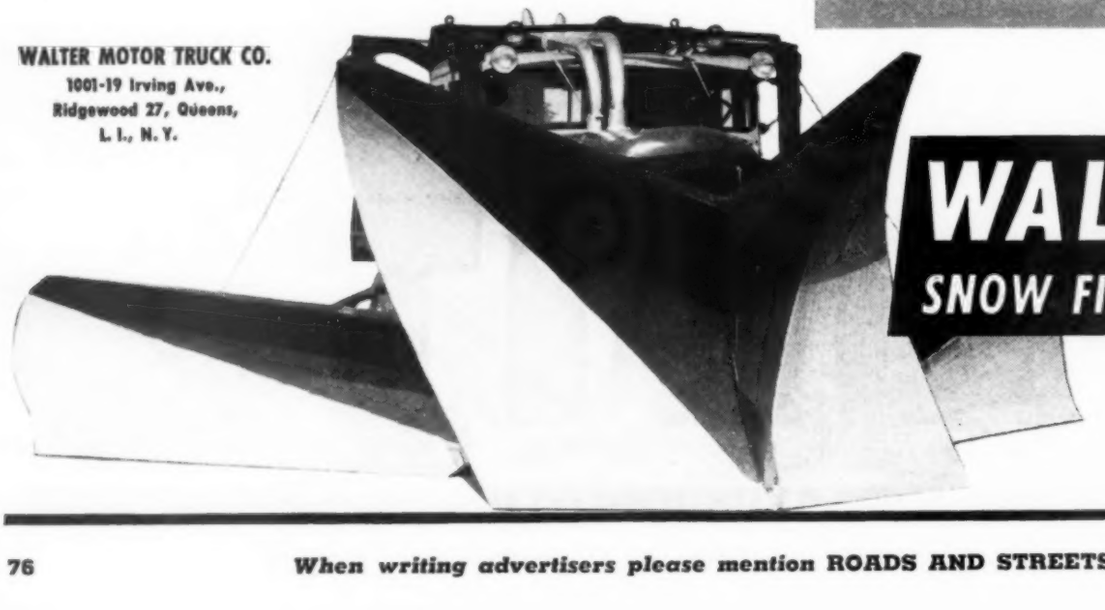

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Tar Soil STABILIZED BASE COURSES

Good performance can be expected for this type of construction if satisfactory soil is available

By Walter C. Ricketts

Airfields Branch, Office, Chief of Engineers, Washington, D.C.

IN general, a tar soil stabilized base course may be described as one which has resistance to deformation under traffic by virtue of the interlocking of the soil particles and the cementing action of the tar. Tar stabilization of soil is accomplished by thorough mixing of a soil with a predetermined and carefully controlled amount of a selected standard paving grade of tar. The selection of the proper grade of tar is dependent on climatic conditions and type of construction to be employed. A base course composed of the resultant mixture properly compacted is resistant to water absorption, a condition which aids in maintaining stability.

Committee Work Summary

The work of the American Road Builders' Association Committee on Tar Stabilized Roads accomplished prior to 1946 is contained in ARBA Technical Bulletin No. 104. It was developed by questionnaire replies from the majority of the organizations who had used tar stabilization that soils classified as A-3 (Public Roads Administration classification) should be considered as Tar-Sand Stabilized Bases and other soils as Tar-Soil Stabilized Bases.

Based on all information available at that time, the conclusions of the Committee briefly were as follows:

1. All sands classified as A-3 stabilized with tar would be referred to as tar-sand stabilization.

2. All other types of soil considered suitable would be referred to as tar-soil stabilization.

3. Soil groups A-1 to A-4, inclusive, are best suited for stabilization with tar, although certain types of A-5 soils having low capillarity and plasticity values may be satisfactorily stabilized.

4. A-5 soils with high capillarity and plasticity values and soil groups A-6 and A-7 as such are not ordinarily suitable for stabilization with tar. Stabilization should not be attempted unless experienced construction forces are available and then only if sufficient granular material may be added to raise the classification to A-4 or better.

5. Tar stabilization with micaceous or highly organic soils should not be attempted.

6. Soil or sand-tar stabilization should only be considered for base course construction. The base courses should be surfaced with a type considered adequate for the traffic conditions.

7. In the case of stabilization of sand with tar, the amount of moisture at the time of mixing should, in general, be 5% or less.

Technical Bulletin No. 104 also contains separate specifications for Tar-Soil Stabilized Base Course and Tar-Sand Stabilized Base Course which were prepared by the Committee and are recommended for general use.

Since the publication of the original report, one meeting of the Committee, of which the author is a member, was held and considerable work has been accomplished by correspondence.

All available data regarding tar-soil stabilized projects have been studied with the view of setting up simple requirements for determining the suitability of soils for stabilization with tar; requirements that may be determined by a minimum amount of testing and still give assurance of satisfactory results. These requirements would be of assistance to organizations having little, if any, laboratory facilities or trained personnel in utilizing this type of construction when suitable soils are available, and would tend to prevent the stabilization of unsuitable soils.

Good Results in Sand

A digest of the tar-soil stabilized bases in the South revealed that those constructed with sandy soils have given satisfactory service for periods up to 12 years, whereas soils containing high percentages of clay and silt had produced bases which have required more maintenance than sandy soil projects. The study of the data on the more successful projects indicates that the plasticity index of the soil did not exceed 15, the mica content less than 5% and the clay plus silt content (considered as material passing the No. 200 sieve) not more than 50%. In general, the other available data taken from satisfactory projects tend to confirm the conclusions.

The plasticity index of the soil is easily determined as is the mechanical analysis of the soil to determine the per cent of clay plus silt (material passing No. 200 sieve). While a test to determine mica has not been standardized, the Committee proposes to recommend later either one or two tests. When a microscopic examination of the soil shows no evidence of mica, it is not necessary to determine the mica content.

By the use of these simple tests, samples of the subgrade material may be tested every 1000 or 2000 ft. or whenever there is an apparent change in soil. If the soil does not meet the requirements, sufficient granular material may be added and mixed with the existing soil to produce soil which meets the requirements. If suitable granular soils are not economically available and cost of mixing is excessive, stabilization should not be attempted.

Existing data indicate that soils meeting the three requirements mentioned above may be successfully stabilized with tar, provided the stabilized soils contain the proper amount of tar, are stabilized to a minimum depth of six inches, and proper construction methods are employed.

The preparation of roads previously surfaced sometimes presents a problem as the addition of selected material may have sufficiently improved the surface layer so it has the desired requirements, whereas the subgrade soil may be inferior. In such cases it is necessary to mix the subgrade material and surface course, adding and mixing sufficient selected granular material so the resultant soil will conform to the three requirements recommended above to the full depth to be stabilized.

The Committee on Tar Stabilized Roads recognizes that:

1. The cost of stabilization warrants setting up soil requirements which will eliminate questionable soils, and give reasonable assurance that soils meeting the requirements will provide satisfactory base courses when stabilized with tar. This is necessary to assist organizations not experienced in soil stabilization.

Presented at the ARBA Convention last July in Chicago

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2. Any set of requirements may eliminate some soils which may be stabilized satisfactorily. However, this is justified as the requirements will eliminate the use of unsuitable soils which may produce unsatisfactory results and retard the use of tar stabilization. The more questionable soils may be successfully stabilized by organizations having highly developed laboratories and trained personnel. However, the chance of successful stabilization is lessened when questionable soils are used.

Corps Requirements

The current Engineering Manual, prepared by the Office, Chief of Engineers, for use in construction of military installations, permits the use of bituminous stabilized soils for base courses only of a flexible pavement, provided the bearing power of the total pavement is sufficient to satisfy the criteria for the proposed design.

The use of bituminous stabilized base courses is to be considered where other types of suitable base course materials are not economically available or where it is not economical or feasible to blend and mechanically stabilize the existing natural soil to produce the required bearing value.

Soils which have high clay and silt contents or cannot be readily pulverized by the usual mixed-in-place equipment are not considered satisfactory for stabilization with bituminous material.

The type of soils considered to be best suited are friable soils possessing inherent stability or whose stability can be improved economically by the admixture of other soils. The lack of stability of poorly graded sands often may be materially improved by the addition of suitable fines containing considerable 200 mesh material.

The bitumen content is determined by appropriate laboratory tests adding sufficient bituminous material to secure maximum strength and durability.

Tar grades, RT-3—RT-7, conforming to Federal Specifications are to be used for mixed-in-place construction. The type of soil, method of construction and weather conditions are the factors to be evaluated in the selection of the grade for the specific case. In the case of hot-mix tar-sand base courses, RT-11 or RT-12 is to be used.

The moisture content of the soil at the time of mixing is held to a minimum, and in no case is the moisture content of the compacted mixture to be sufficient to adversely affect the stability of the base course at the time of placing the surface course.

Travel or stationary plants rather than the usual mixed-in-place equip-

ment are to be used whenever economical and feasible. The finished mixture is to be spread in relatively thin layers and compacted to maximum density.

The Corps of Engineers requirements, while generally in accord with the findings of the ARBA Committee on Tar Stabilized Roads, may be too restrictive for use in connection with the construction of base courses for relatively light traffic roads. However, in most cases military pavements are subjected to wheel loads of greater magnitude than are encountered on the usual highway pavement.

The Corps of Engineers utilized tar-sand stabilized base courses in constructing runway pavements in whole or in part on eight projects between 1941 and 1943. All the sands employed were A-3 type, PRA classification, and were typical of the sands found on the southern part of the Atlantic Coastal Plain.

Portions of the runway base courses on both Hunter and Chatham Airfields, located near Savannah, Georgia, were constructed 5 in. compacted thickness of the existing sand, stabilized with RT-7. The sand and tar were mixed by a travel plant and surfaced with hot-mix pavements. Portions of the pavements on Chatham Airfield have since been sufficiently reinforced by additional layers of hot-mix pavements to withstand the traffic of heavier planes developed after the initial construction of the field.

Tar-sand base courses, hot-mix type, were used for runway pavements either in whole or in part on the following airfields: Valdosta Municipal Airport, Valdosta, Georgia; Barnwell Airfield, Barnwell, South Carolina; Liberty Airfield, Hinesville, Georgia; Sylvania Airfield, Sylvania, Georgia; Harris Neck Airfield, Harris Neck, Georgia; and Statesboro Airfield, Statesboro, Georgia.

The base course mixtures were composed of local sand and RT-12, produced in a standard hot-mix paving plant and constructed in accordance with standard paving practices. In all cases the base courses were surfaced with a course of high type hot-mix bituminous mixtures. As hot-mix tar-sand base courses are generally less affected by weather conditions than those produced by mixed-in-place method, a hot-mix plant was utilized for the production of the base courses for these airfields. Expeditious construction was demanded at that time due to a national emergency.

As Barnwell Airfield in South Carolina is typical of the six airfields on which hot-mix tar-sand base courses were used, it has been selected for additional discussion.

(*Continued on page* 102)

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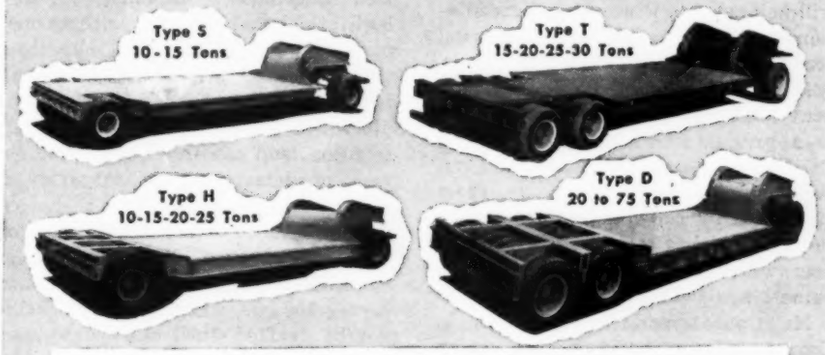

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Getting on With Road Contracts

One of Many Problems Discussed at AGC Midyear Board Meeting in Chicago

AN all-day session on road contracting problems was part of the program at the Edgewater Beach Hotel in Chicago, Sept. 13-15, where some 300 leaders and delegates of the Associated General Contractors of America, Inc., held their mid-year meeting. Chapter presidents and secretaries, committee heads and national staff members comprising the governing and advisory boards made up the attendance.

Incoming AGC president Teichert and retiring president Winkelman

The boards nominated Adolph Teichert, Jr., Sacramento, Calif., for president, to succeed D. W. Winkelman, Syracuse, N. Y.; and Walter L. Couse, Detroit, Mich., to succeed Mr. Teichert as vice president. Elections will be held this winter, with installation of new officers at the next annual convention in New York in February.

Mr. Teichert, who heads a highway, heavy and railroad construction firm, is a graduate of the University of California. He was engineer and superintendent of the company from 1908 to 1910, a co-partner from 1910 to 1927, and has been president of the firm which now operates under his name since 1942.

Mr. Couse, president of Walter L. Couse & Co., a building firm which has constructed a number of automobile plants, was chairman of the Building Contractors Division of the AGC in 1947; is now co-chairman of the Joint Cooperative Committee of the AIA and AGC; and is chairman of the Market Development Committee.

At general morning sessions, managing director H. E. Foreman summarized recent affairs and several nationally prominent speakers were heard.

"The Military Engineer Needs Civil Works" was the subject by Brig. General P. A. Feringa, assistant chief of engineers.

Basing Point Problems

William Simon, general counsel for the U.S. Senate's Capehart trade policy committee addressed the meeting on the recent abandonment of basing point price systems by many material producers. Since the Supreme Court ruling last April, there has been little time for the supply industry to make adjustments, but contractors have shown much concern. He pointed out that contractors are perhaps the group most vitally affected by this decision. Any new pattern of local price differentials between various localities, he noted, will affect the prices contractors will have to bid on jobs. Jobs remote from material manufacturing points require higher bids because material sellers must pass freight charges along.

Most of the correspondence received by the Senate Committee on this subject has been of a complaint nature. Admitting the complexity of the subject and its possible far-reaching effects on business, this speaker promised that inquiry into need for new legislation would be made with an open mind. Congress, he noted, has three times declined to pass legislation outlawing uniform delivered prices and all forms of systematic freight absorption, and can no longer avoid the task of determining what policy is best for the nation.

President of AGC, D. W. Winkelman of Syracuse, N. Y., talked on building trades apprentices, now numbering 130,000, whom he urged should not be drafted until allowed to complete their training.

Many Road Problems

Federal-aid road fund allocations will reach $400,000,000 this year, an all-time-high, reported Glen Maxon, Maxon Construction Co., Dayton, O., chairman of AGC's legislative committee.

With George Koss, Koss Construction Co. of Des Moines, presiding, highway contractors and secretaries of AGC highway chapters put in two lengthy round-table sessions. The federal-aid secondary road program was a lively topic. Contractors have shown concern in some states over a tendency for counties to favor force account methods for projects under this program. In some states secondary road work has attracted few contractors while in others, notably Texas, North Carolina, and a few other states, farm-to-market roads have been pushed and have attracted many bidders, with satisfaction all around.

New county commissioners come into the picture after each election one state leader observed, and in short time are road experts rarin' to take over county road jobs as day-labor projects and tell their engineer what to do. [Not a local but a widespread problem—Ed.] In other states secondary roads are tied into political maneuvers for or against allocation of gas tax funds for this class of construction.

On a contrasting subject, it was asked why more contractors don't bid on urban federal-aid highway work. The condition in this respect has varied greatly. In Minnesota it was pointed out that the Twin Cities and other city-areas were zoned for higher labor rates, and contractors used to rural jobs hesitated to take their crews into these areas. Again citing Texas, big-city expressway projects have been offered in rather large (million and up) parcels, with ample competition though fewer bidders.

An important point noted in getting on with the big urban road tasks is that contractors can aid in the educational job among local taxpayers. Right-of-way costs are very high, of necessity. These costs will not get lower, and city people must realize that delay in solving congestion is costing their community far more than the price of the construction.

New York's highly developed and well conceived state program for urban arterials has been retarded because few of the state's one hundred and eleven road contractors have wanted to big on urban jobs. Engineer estimates are legally the ceilings for bid prices in this state, and these estimates have been too low in the past, said one spokesman. Only since July, 1948, has this situation been corrected somewhat, it was said. Engineers habitually estimate too low

or city jobs because their experience has been predominantly rural. They fail to comprehend the difficulties involved in jobs that include sewers, water and other ultilities; ditto for traffic interruptions, difficulty in material deliveries, etc.

Also a reason for the slowness of urban road programs, and one for which there is no answer, is the fact that eastern cities are old, and that they are the scenes of conflicts by overlapping planning boards and political bodies. Progress in these cities is sure to be slow.

General Provisions

One of the subjects contractors like to hash over when they get together is general specifications and general contract provisions. PRA and AASHO have wanted more uniform specifications and AGC's natural desire was to make its views known in this connection. A model specification was worked out in recent months, after a couple of years or more of committee work, and submitted to the AASHO group for action. State contractor groups were urged to take this matter up with their respective state highway departments and make their local preferences known. Contractors, however, are still divided in their opinion as to what good will come out of nationally uniform general specifications. From the contractor's standpoint, the fact that a specification has become nationally standardized makes it that much harder to seek a justifiable change in the wording at some later date. A purely local or individual specification can be more easily taken up with the state where contractor groups feel justified.

Engineer Shortage Question

Contractors are still vitally concerned by the shortage of highway engineering personnel because it limits the size of the road program. Contractors in certain states are working to get more young men into highway engineering college courses, and into highway departments or road building work afterward.

In Texas, for example, "grants of opportunity" awards are made with funds contributed by industrial corporations, including road contractors. These are given to selected young men who otherwise could not go to college. Among the 60 men currently being sponsored, several are supported by road firms.

A road scholarship scheme is being worked currently in Kentucky, where it is said that not a single engineering grad entered the highway department from 1933 to this year, when two men joined! [Nationally, a survey showed that of 179,000 students in engineering schools, only 3,358 graduated in civil engineering and only 549 indicated an interest in highway work.]

Executive Committee. Standing, George C. Koss, Koss Construction Co., Des Moines, Iowa, chairman of the Highway Contractors' Division; William Muirhead, Wm. Muirhead Construction Co., Durham, N. C., A.G.C. secretary-treasurer; G. W. Maxon, Maxon Construction Co., Dayton, Ohio, chairman, Legislative Committee; F. W. Parrott, C. F. Lytle Co., Sioux City, Iowa, 1947 president; C. P. Street, McDevitt & Street Co., Charlotte, N. C., chairman, Public Relations Committee; S. L. Fuller, John F. Casey Co., Pittsburgh, Pa., chairman, Heavy Construction and Railroad Contractors' Division; H. A. Dick, The Gilpin Construction Co., Portland, Oregon; A. L. Atherton, Atherton Construction Co., Seattle, Wash., chairman, Building Contractors' Division; Gayle Armstrong, Roswell, N. M.; H. E. Foreman, Washington, D. C., managing director; Walter L. Couse, Walter L. Couse & Co., Detroit, Mich., nominee for 1949 vice president. Seated—Dwight W. Winkelman, D. W. Winkelman Co., Syracuse, N. Y., 1948 president; A. Teichert, Jr., A. Teichert & Son, Sacramento, Calif., 1948 vice pres. and nominee for 1949 president.

In California the contractor chapters are promoting engineering as a career for young men, not to get them into the highway department, but into their contractor organizations. Twenty grads were taken on this June.

The poor grade of field engineers found on some jobs was described, one example being of a small project where the contractor waited many days for it to be staked out, then moved in and did the grading in three hours. In contrast, many engineers are working efficiently and long hours to offset personnel shortages in this boom period of construction.

Examples were shown that some road departments pay well in comparison to other governmental agencies and with private industry, offering other inducements also that make highway engineering a satisfactory career. Glamorizing the field and selling it systematically to young men are necessary, it was said. However, the basic need to get better pay and working conditions in highway departments remains, and contractor organizations will continue to work constructively on this problem.

Importance of Continuity

Again at this meeting, as in all recent contractor meetings, everyone present agreed on the importance of a steady, continuing pace of highway work. Continuity enables the contractor, and also everyone along the line clear back to the equipment and materials manufacturer, to produce more economically, resulting in lower costs and hence lower bid prices. Highway departments which haven't already done so were urged to come out with long-range programs and to publicize the importance of the long-range idea.

George C. Koss, Koss Construction Co., Des Moines, Iowa, chairman of the Highway Contractors Division; and Archie N. Carter, Washington, D. C., manager of the Highway Division

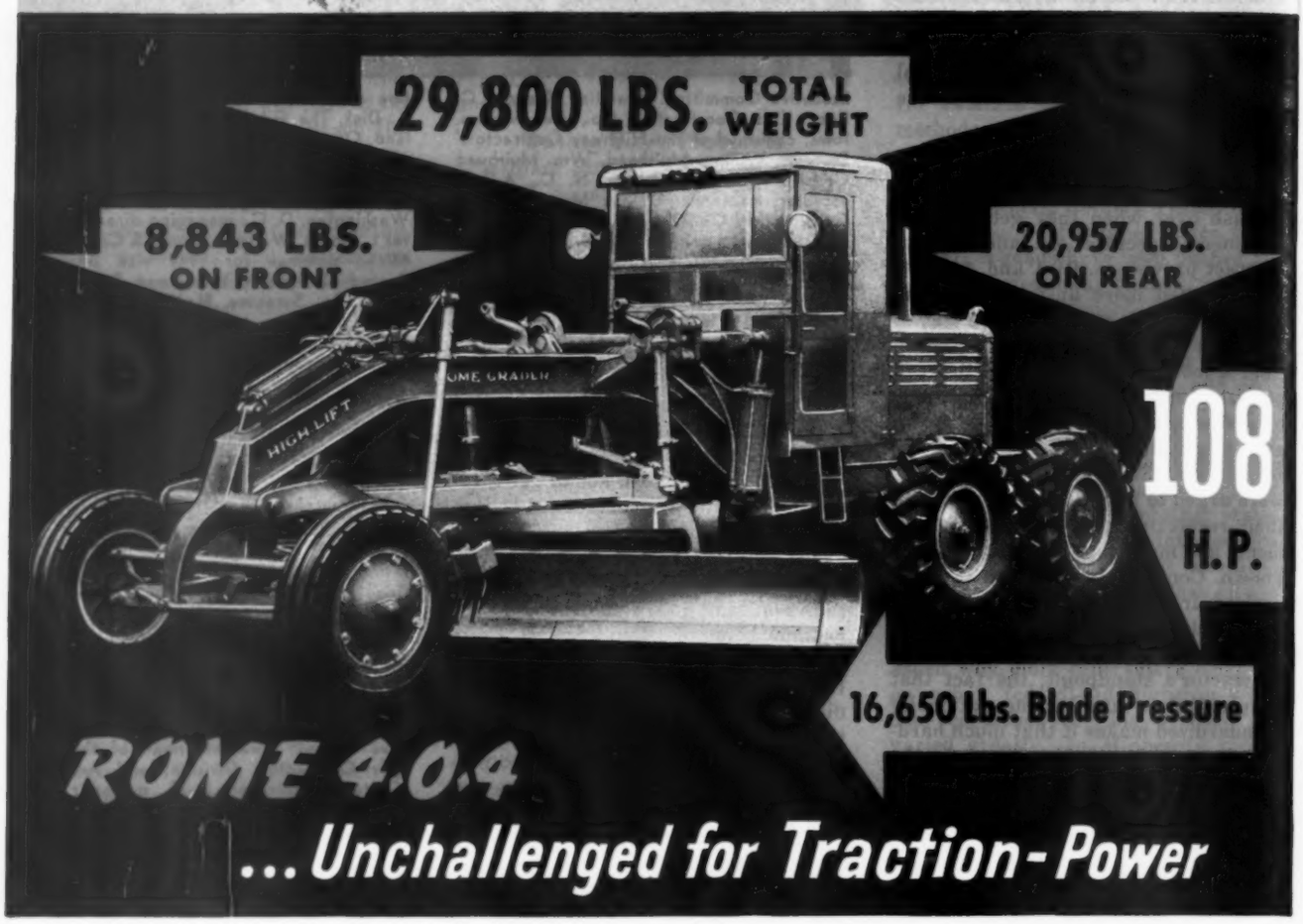
Some states are far behind in expending state funds and hence in matching federal allocations. This situation makes it more difficult to go before Congress for requests for the increased funds wanted by other states and actually needed everywhere.

Prequalification of contractors continues to be a lively topic among contractors. At Edgewater Beach the feeling was divided on the value of strict regulations. "We don't have it and don't want it," was one point of view. "Prequalification has worked well in our state," was another. In Nebraska it was noted that not a single job has been "finished by the bonding companies" since 1939 when prequalification came into effect. Some question of the soundness of prequalifying on the old-time basis of "ten times quick assets" was noted, the fact being that a contractor's ability to perform work today depends often on what equipment he owns ready to go, as well as how much credit he can dig up with a bank.

The recent slowness of getting on

(*Continued on page* 89)

"WEIGHT *produces* TRACTION, traction PLUS POWER *produces* pull on blade"



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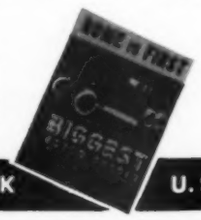

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A Low Cost Concrete Bridge

By B. A. Trice
Texas Highway Department, Austin

THE search for construction methods which will provide the best facilities for the least money continues to be a challenge of engineering skill and judgment. In these days of rising prices, scarcity of labor and materials, together with the development of new machines and machine-conscious personnel, the search is accelerated and the need for the development of economical methods becomes more and more pressing.

This is particularly true in the case of those persons entrusted with the expenditure of public funds. These people should be acutely aware of their charge. It is the duty of each of them to accept the idea as his personal concern that each dollar of public funds expended will produce the maximum return.

In the search for economical methods, the designer's choice is presently influenced by two prime factors: simplicity and mass production.

Simplicity Basic Need

The necessity for simplicity is becoming more and more urgent due to the continued scarcity of certain materials and to the great dearth of craftsmen. Every single detail which adds an operation or a new material to a project is not only expensive by virtue of the cost of the material and the craftsman required to perform the operation but also by virtue of the delay which will almost certainly result in the procurement of the material and the craftsman required. The unprecedented amount of bookkeeping, reporting and analyses presently required of any business organization has served to raise overhead costs sharply and for this reason delays are important and expensive. The need for simplicity is, therefore, of extreme urgency.

The inherent economies provided by mass production have long been realized in the manufacturing field, and all business is quick to realize its advantages and to employ its principles whenever possible.

In its continued search for economical construction methods, the Texas highway department has developed a concrete deck bridge which is believed to employ the principles of simplicity and mass production to a high degree and is expected to yield substantial economies.

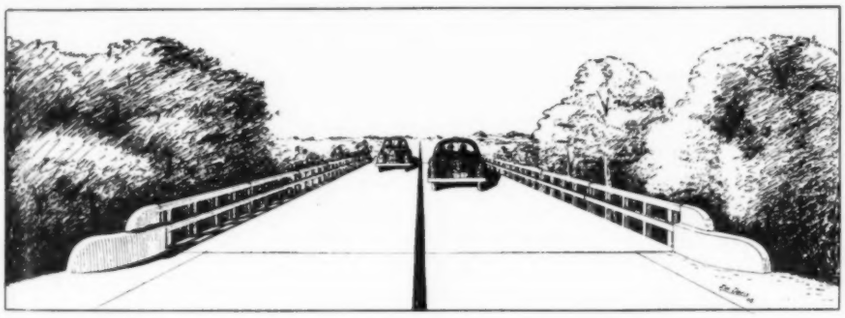
The cross section of the deck is a series of arches on 3-ft. centers which is calculated to develop two advantages: (1) the proper distribution of concrete and reinforcing steel such as to make maximum use of these materials; and (2) forms can be made self-supporting, thus eliminating the need for falsework. A combination of these two advantages produces a third advantage in that we are able to form and pour concrete having the structural advantage of girder construction at the same unit price required for slab construction.

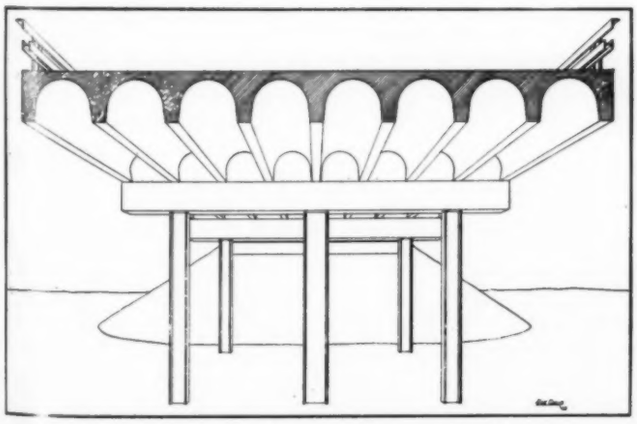
Forms are constructed from rolled sheet steel in such a manner that all interior forms are identical and interchangeable. One-eighth-inch plate is used with small lug angles welded along the lower edges for connection to adjacent forms, and each form is provided with rib plate stiffener at 3'-6" intervals. Each interior form for a 30-ft. span weighs 1,080 lb., and will support the dead load of the concrete plus an ample allowance for temporary loads during construction. Side forms are of ⅛-in. plate with stiffener angles providing the required rigidity.

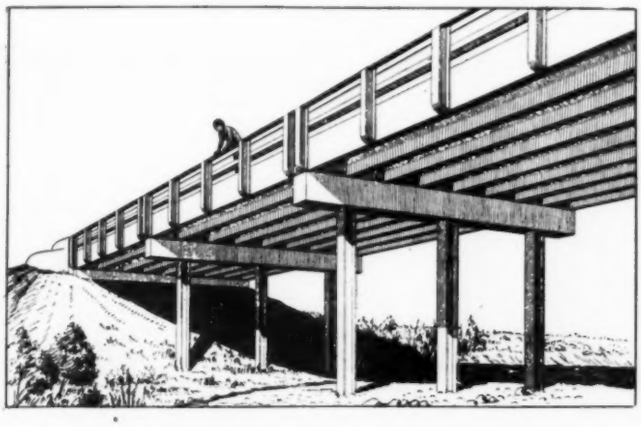
The roadway width is determined by the number of arches provided, and will vary by increments of three feet.

Simply Constructed

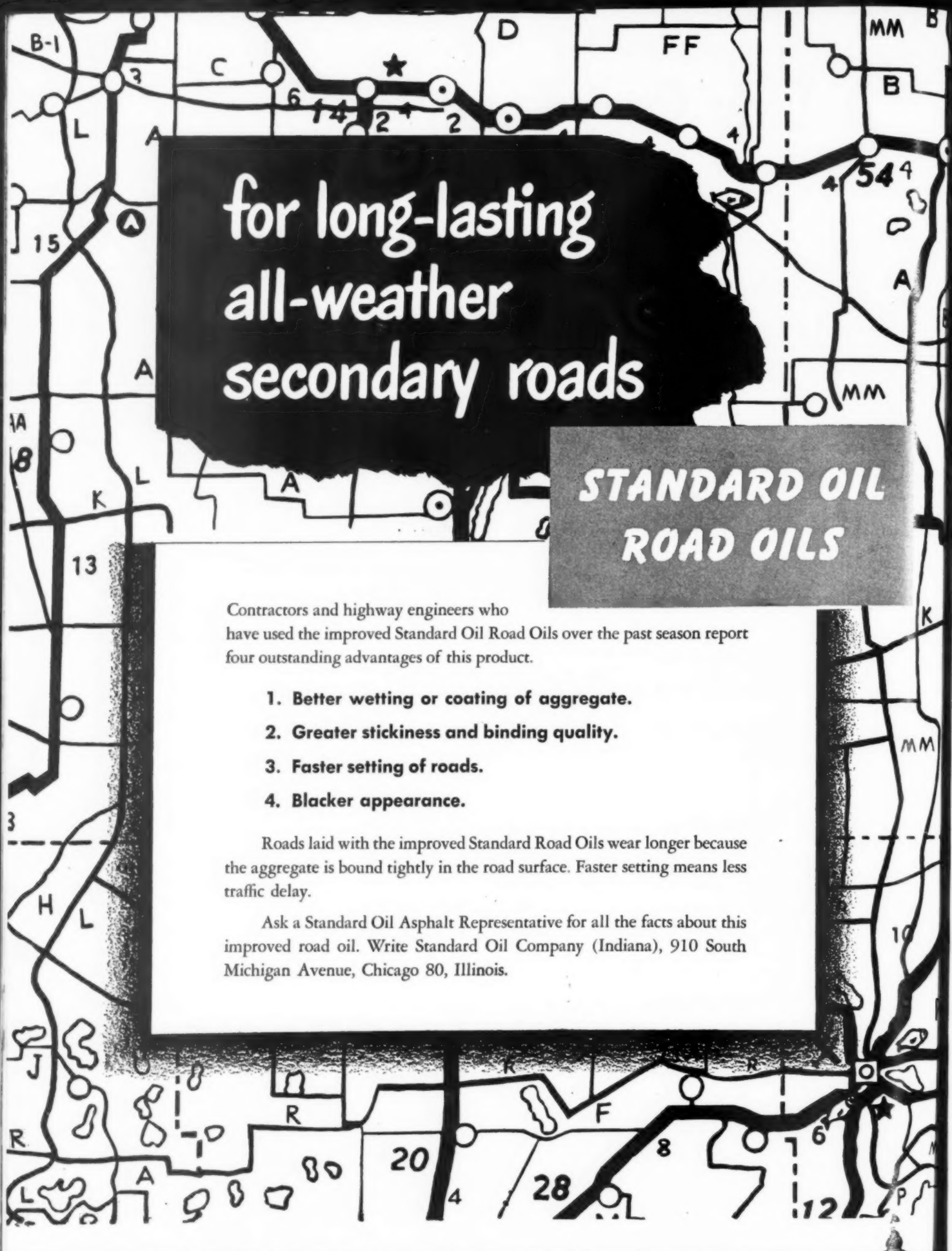
Erection: As the concrete cap is cast, holes are provided near the top of the cap by the use of greased rods or pipe, and bolts are later inserted through these holes to anchor a temporary shelf angle which will support the steel forms for the deck. Each form section is set in place with a small dragline or winch truck and is bolted to the adjacent form and adjusted to grade by the use of oak wedges on the shelf angle. Each form







★ Showing general details of the Texas "economy" bridge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has a bulkhead at each end built on a batter in the longitudinal direction so as to insure easy removal of the forms. No additional forms are required other than a bulkhead at the end of the span.

No concrete curb is provided. This factor alone eliminates a great amount of intricate formwork and hand finishing and eliminates a number of chances for bad lines on the bridge. The rail posts are fastened to the outside fascia with anchor bolts cast in the concrete and the rail consists of a heavy lower collision member and a lighter upper section.

Capacity: The structure can be varied to accommodate any of the standard highway loadings by the simple expedient of increasing or decreasing the thickness at the soffit and by changing the size of the girder reinforcing, using the same steel forms in all cases.

Reinforcing: The reinforcing system consists of a single plane of light bars in the slab and heavy girder steel integrated by the use of stirrup bars. No special bending or trussed bars are required.

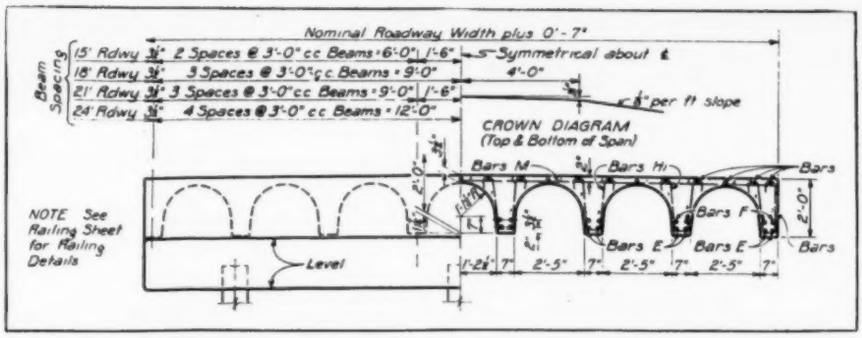
Placing Concrete: The concrete is placed continuously across the roadway beginning on one side and filling the first form completely and progressing across the roadway, and is struck off by the use of a longitudinal screed. No hand finishing is required, and the grade is established by the end bulkheads and the screed.

How Forms Removed

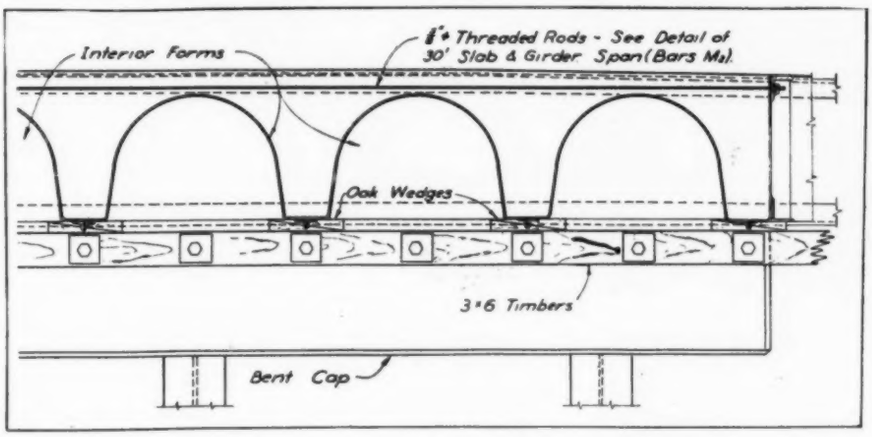
Removal of Forms: Each form has a small hole cut at the soffit at the center line of the span. Before the concrete is placed, a short pipe sleeve is placed over each of these holes. When the forms are to be removed the oak wedges are removed and the forms are allowed to drop two or three inches onto the shelf angles. Small cables are inserted through the holes in the slab and tied to the form, which can then be lowered to the ground by the dragline or winch truck.

Cost: If the original cost of the steel forms is discounted, the cost of this type of construction is far less than any other type the Texas highway department has been able to devise to meet average requirements. There is less concrete and reinforcing steel and the unit cost of both the steel and the concrete should be considerably lower than in any other type of construction. The simplicity of all of the operations, the small amount of equipment required, and the speed of construction all contribute toward a lower unit cost of materials. The steel forms, however, will probably be expensive on a per pound basis but with nominal care in handling they could be subjected to an almost indefinite number of reuses. For this reason, it is obvious that this type of construction should be used only if it is to be applied to a large number of bridges or to a few bridges of extreme length.

The idea for this type of construction was developed by C. S. Matlock and E. A. Jelinek under the general supervision of James P. Exum, bridge engineer, Texas highway department.



★ End section and cross section of floor, designed to permit use of inexpensive pan-type metal forms



★ Forms consist of a set of pans, crimped and welded into panel sections with end sheets sloped to form the beveled pier cap. Three metal stiffener sheets are also welded inside each arch at intervals along its length. Details of this suggested form design are available to contractors

Tallamy Succeeds Sells as N. Y. Superintendent of Public Works

Bertrand Tallamy has been appointed by Governor Dewey to succeed Charles H. Sells as superintendent of public works of the state of New York. Mr. Tallamy was chief engineer of the department, and formerly deputy superintendent. Mr. Tallamy came with the department in 1945, after a long and varied career as a consulting engineer with his own firm, and more recently chief engineer of the Niagara Frontier Planning Board. While deputy superintendent of public works, Tallamy supervised the department's division of administration and was responsible for formulation of the state's 840 million dollar postwar program of public works construction. He organized the new bureau of arterial route planning, through which detailed plans for highway construction within each city of the state was currently being prepared and carried out.

C. H. Sells

B. Tallamy

●

$12,000,000 Earth Moving Job— Four bids were received Sept. 16 by Garrison District, Corps of Engineers, Bismark, N. Dak., for StageII-excavation and main embankment for Garrison Dam. The joint bid of Peter Kiewit Sons Co., Omaha, Neb., and Morrison-Knudsen Co., Inc., Boise, Idaho, at $13,622,066, was the lowest. U.S. Government estimate was $11,-903,543.

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Sub-Contract with Caution

By E. T. Nettleton
Associate Highway Engineer
State Highway Department of Connecticut, Hartford

CONSTRUCTION concerns often find it advisable to arrange a sub-contract for part of a construction project. There are several logical reasons for such action. The general contractor may lack personal knowledge, skilled artisans, or distinctive equipment to do a certain specialized type of work. Because of the size of the total project it may be more economical to sub-let a portion of the work rather than purchase or rent additional units of equipment to meet the peak load demands of an individual project. The general contractor may lack sufficient labor to complete all the work within the specified time allotment of the contract. Conditions often arise which make it advisable for a general contractor, not too well known or too well informed as to local conditions, to sublet some of the work to a smaller contractor located in the vicinity. In some cases it is possible for a contractor to sub-contract certain types of work for a price which is cheaper than he could actually do the work himself.

However, before rushing into any agreement for a sub-contract, there are many factors which should be considered.

Consider Legal Aspects

The legal aspects are of prime importance. It may be that the contractural documents for the project specifically state that no sub-contracting will be permitted. This is often circumvented by a general contractor placing the labor forces of the intended-to-be sub-contractor on his pay roll. Profit to the sub-contractor may be in the nature of a straight salary or a percentage for supervision. In this case no sub-contract exists in the eyes of the law. The general contractor alone is responsible for all actions, claims, or suits against the other contractors, employees, or deeds. Sometimes the contractural documents specify the maximum per cent of total value in dollars of the whole contract over which sum the general contractor is not allowed to sub-contract. Practically all specifications state that when a general contractor sub-contracts part of the work, the general contractor is in no way released from any responsibility inherent to him by the stipulations included in the general contractural documents. This means that the general contractor assumes the liability for all acts, omissions or commissions of the sub-contractor as well as responsibility for the quality of the workmanship of the latter. Furthermore, the general contractor is subject to all claims for payment of wages, salaries, materials, equipment, and other expenses made by the sub-contractor which lie within the scope of the sub-contract.

Working Together

Besides the legal matters involved, there are many operating factors which should be considered. Perhaps there may be more than one sub-contractor. Whatever the case may be, there should be some understanding as to the scheduling of work in order that there may be the least working interference possible between sub-contractors and the general contractor. It may be necessary to agree upon the completion date of the sub-contract work in order to avoid delay in the general construction program. Possibly a penalty for non-compliance may be necessary. Furthermore, the operations of all sub-contractors shall be carried out in such a manner that the safety of the employees of both the sub-contractor and the general contractor is not jeopardized. Too little attention in drafting agreements is paid to labor conditions, restrictions, rules and regulations which, if they conflict, may bring about dissensions, jurisdictional disputes, or work stoppages.

A valuable asset in any sub-contract agreement which should not be overlooked is the necessity for a clearly defined written document. Included in such an agreement must be a reference that all work of the sub-contractor must meet and be done in accordance with the requirements of the original contract. For the convenience of the reader, a typical form is included as an addendum to this article.

Sub-contracts Not Best

As a general rule it may be stated that it is not usually the best policy to resort to sub-contracting. The fact that many sub-contractors are inexperienced constructors, insecure financially, and unable to obtain work in open competition, tends to classify these sub-contractors as potential risks. Furthermore, under open competitive bidding there is not usually financial margin enough for two profits, one accruing to the sub-contractor, and the other to the general contractor. If, however, sub-contracting is to be resorted to, it is a good policy to award the work to a sub-contractor of recognized ability and integrity. Furthermore, a definite written sub-contract agreement form should be drawn up, and it should be properly signed and witnessed.

(Any opinions expressed in the above article are those of the author, and do not necessarily reflect the views of the State Highway Department of Connecticut or of this publication. This article may not be reprinted without the permission of the author—Editor)

General Provisions

Section 1. That the Sub-Contractor agrees to furnish all labor, tools, forms, lantern protection, overhead, and other necessary incidentals to properly perform all work as herein described to the satisfaction of the ..... and the Contractor, and to meet the plans, special provisions, and specifications for the work.

Section 2. That the Sub-Contractor agrees to furnish all supplies and materials needed to perform such work

SUB-CONTRACT FORM

This agreement made this ..... day of ..... between ..... of ..... Contractor and ..... of ..... Sub-Contractor pertaining to certain work herein stated on the .....

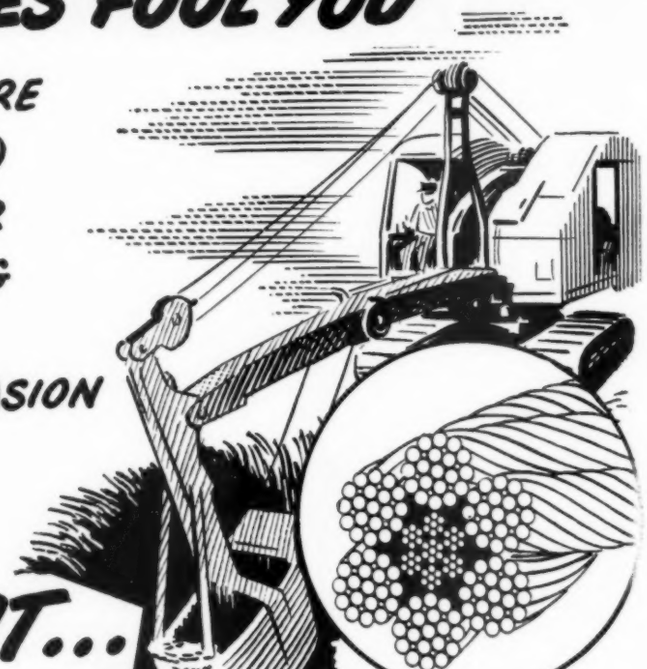
.....

.....

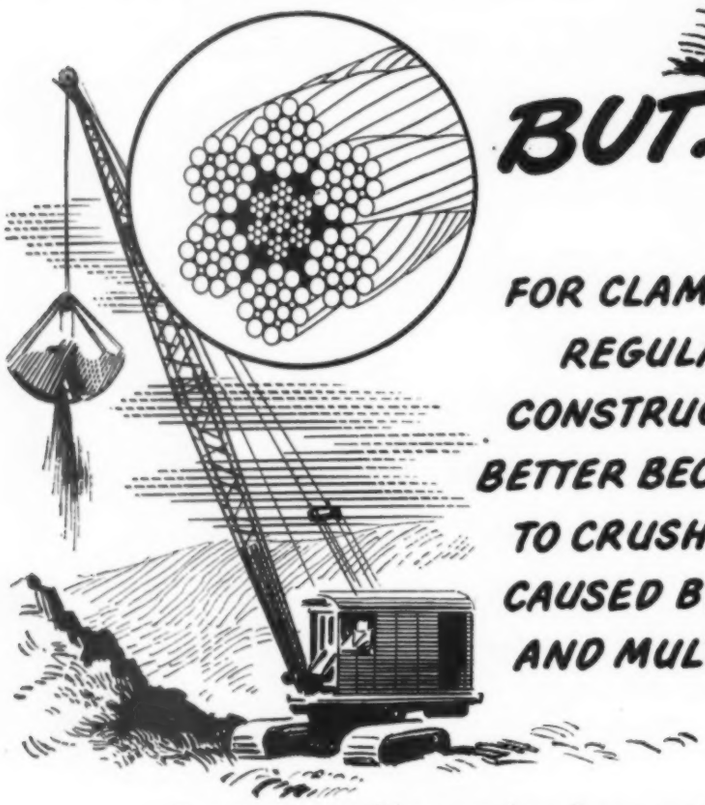
WITNESSETH: That the Contractor and Sub-Contractor, for the consideration hereinafter named, agree to the general provisions as follows, unless amended by the special provisions herein attached, namely:

SOME ROPES FOOL YOU

U-W 6x19 LANG LAY FILLER WIRE CONSTRUCTION (WITH I.W.R.C.) IS GOOD FOR TRENCH HOES OR BACK DIGGERS BECAUSE LANG LAY CONSTRUCTION OFFERS GREATER RESISTANCE TO ABRASION AND BENDING FATIGUE



BUT...



FOR CLAM SHELL CRANES, U-W 6x19 REGULAR LAY FILLER WIRE CONSTRUCTION (WITH I.W.R.C.) IS BETTER BECAUSE IT IS MORE RESISTANT TO CRUSHING AND DISTORTION CAUSED BY HIGH RADIAL PRESSURE AND MULTIPLE SHEAVE REEVING

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241 Oliver Building, Pittsburgh 22

and further agrees that all supplies and materials furnished be acceptable to the ..... and the Contractor, and that such supplies and materials meet the plans, special provisions, and specifications for this work.

Section 3. That the Sub-Contractor agrees to abide by all the labor restrictions, pay the specified wages as set up in the plans, special provisions, specifications, or otherwise required by law pertaining to this contract and if required to do so, to submit certified payrolls as well as receipted bills for all claims against this job, and if further required, sign a notarized statement that all claims are paid to either the ..... or the Contractor on request before receiving payments from the Contractor.

Section 4. That the Sub-Contractor further agrees to carry workmen's compensation and property damage in the amount of ..... and public liability of ....., respectively, at the expense of the Sub-Contractor.

Section 5. That the Sub-Contractor agrees to furnish to the Contractor a satisfactory bond in the amount of ..... for fulfillment of this sub-contract, such bond to be at the expense of the Sub-Contractor.

Section 6. That the Sub-Contractor agrees to furnish to the Contractor a satisfactory bond in the amount of ..... to guarantee the payment of all debts pertaining to materials, rental of equipment, or labor used or employed in the execution of the sub-contract.

Section 7. That the Sub-Contractor agrees to start the work on or before ..... and complete the several portions and whole of the work included in this sub-contract by .....

Section 8. That if the Sub-Contractor fails to start or to prosecute the work, or any separable part thereof, as will not insure its completion within the specified time, the Contractor may, at his discretion, terminate this sub-contract upon ..... days notice. In such case the Contractor may elect to finish the work himself, or select another Sub-Contractor, and any difference in cost will be assessed against the original Sub-Contractor, or the Contractor may elect to terminate this sub-contract and allow the Sub-Contractor payment on that portion of work completed at the time.

Section 9. That the Contractor has the privilege of increasing or decreasing the amount of work in accordance with the increase or decrease of the general contract, pertaining to sub-contract items, without any claims from the Sub-Contractor other than increase or decrease in payment, as the case may be, based either on the unit figures for each item or, if a lump sum item, based proportionally on the amount of increase or decrease in the quantities involved.

Section 10. That any claims the Sub-Contractor has for extra work, except as herein provided, will not be allowed unless the same has been ordered in writing by the Contractor and the price stated in such order.

Section 11. That the Sub-Contractor agrees not to sublet any of the work included in this sub-contract without the written permission of the Contractor.

Section 12. That the Contractor agrees to pay the Sub-Contractor monthly, for the performance of all work performed by the Sub-Contractor, on or before the ..... of the month following the month such work was done, in full payment, less .....% retained until completion of the total sub-contract.

Section 13. That this agreement is null and void unless the agreement is approved by the owner!

WITNESSETH: That the Contractor and Sub-Contractor, for the consideration hereinafter named, agree to the following Special Provisions, as well as the General Provisions listed above (except where such General Provisions are amended by these Special Provisions namely:)

WITNESSETH: The Contractor and Sub-Contractor hereby agree to the above General and Special Provisions.

WITNESS:	.....	AGREED TO BY SUB-CONTRACTOR .....
	.....	PER .....
WITNESS:	.....	AGREED TO BY CONTRACTOR .....
	.....	PER .....
WITNESS:	.....	APPROVED BY OWNER
	.....	PER .....
DATE		

The $75,000,000 Penn. Turnpike Extension

(*Continued from page* 56)

tracts will be required for grading work with the individual contracts varying from 2 to 8 miles depending upon the terrain and geological formations encountered and the number of drainage and grade separation structures involved. Grading operations for paving are scheduled to begin in mid-September 1948 and to reach completion Oct. 1, 1950.

The relocation of state and township roads is planned to proceed concurrently with the grading work and thereby minimize the inconvenience to traffic on existing highways crossing the project.

All paving contracts are scheduled for completion in two construction seasons extending from March, 1949 to October, 1950. The installation of roadway appurtenances such as guard rail, delineators, line striping and right-of-way fence immediately follow paving operations and are scheduled for completion in December, 1950.

Three major structures, namely, the Susquehanna River Bridge, the Swatara Creek Bridge and the Little Cocalico Creek Bridge, will be constructed under separate contracts. Construction plans for these structures were started in June, 1948 so that contracts can be awarded in the fall of the same year. Completion of the structures is scheduled for the spring of 1950.

The construction of the toll booths and maintenance buildings can proceed independently of the other major phases of the work and completion of these facilities within the time limitations presents no problem.

Getting on with Road Contracts

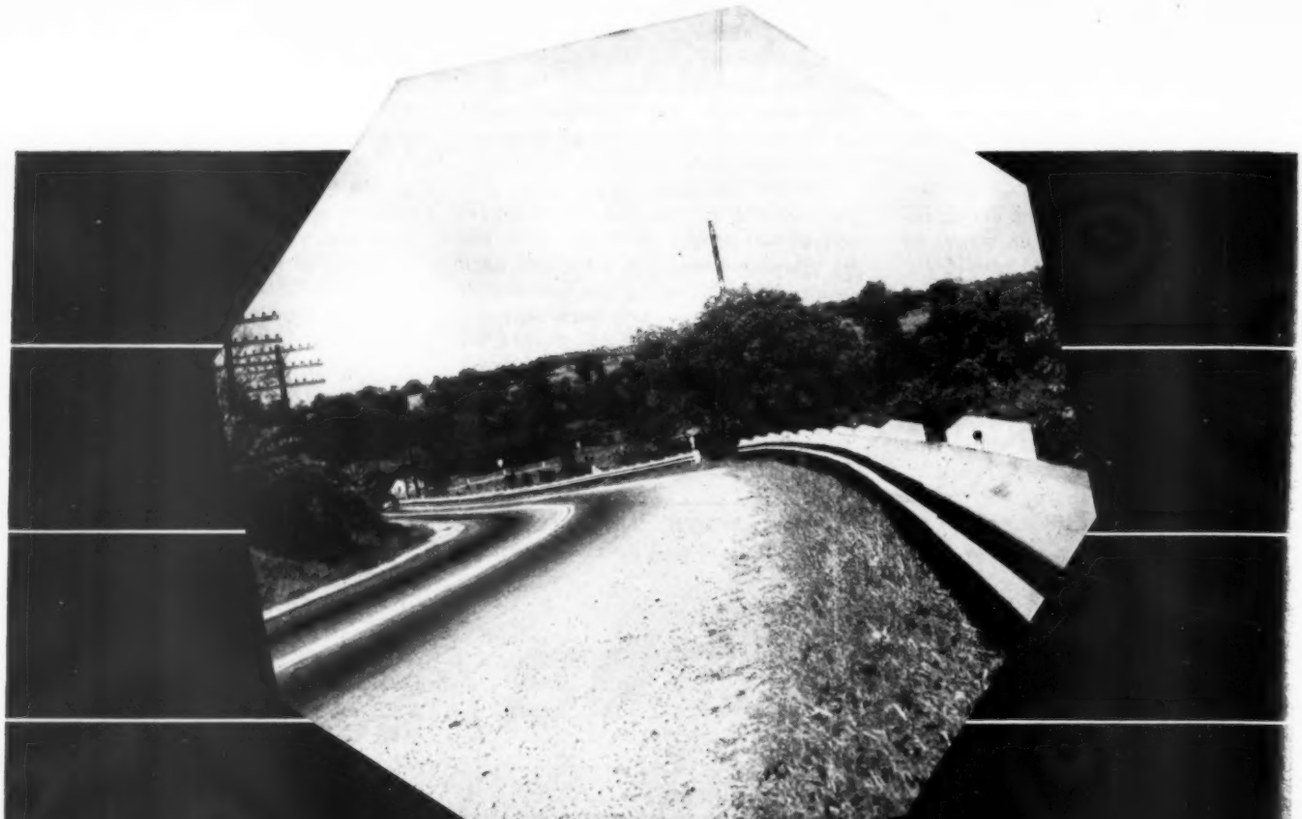
(*Continued from page* 81)

with the federal airport program was discussed. Project programming has accelerated fast of late, however, a congressional OK on Class IV and V metropolitan fields, as required by law, will further step up airport construction volume. Contractors were urged to work with local city governments to set up needed projects for federal participation. Members present were also urged to get and study the new CAA specifications, which are for "reference" but not mandatory use by local sponsoring groups, many of which have consulting engineers with local ideas on design and construction procedures.

Many other topics were taken up briefly. One, of course, was the growing cement shortage, which seems destined to be with us for some time.

●

Traffic accident fatalities for 1947 in the U.S. were down 3% from 1946 despite 10% increase in traffic volume. The total of 32,300 deaths represents 8.6 deaths per 100,000,000 vehicle-miles, a new low record.



SAFETY is no accident

As an experienced highway engineer you know there can be no compromise with safety. Halfway measures have no place in your designs. We feel the same way about FLEX-BEAM Guardrail.

Every detail of this sturdy guardrail is designed for utmost safety. It has high visibility that shouts a warning of danger ahead. There is strength galore but not the kind that means sudden, sickening stops. This rail has flexible, corrugated metal strength that cushions the impact while it deflects and guides a striking vehicle until the driver regains control. No wonder it promotes safer driving and guards against injury and loss of life.

Sturdy FLEX-BEAM Guardrail is made from heavy-gage steel for toughness and resiliency. Heat-treated bolts assure positive splices. All the strength is in the rail. There are no springs or anchorages. Each installation has a continuous, flexible beam action with consistently high resistance to impact at any point along its entire surface. Dangerous pocketing is eliminated.

You will also like FLEX-BEAM because it is simple to install and maintain. Unskilled men make the installation with ordinary hand tools. Maintenance is sure to be low because an occasional painting is generally all that's required.

A small investment will convince you that FLEX-BEAM is the simple, practical way to lessen certain traffic hazards. Write for complete data and ask about FLEX-BEAM Bridge Rail. Armco Drainage & Metal Products, Inc., 3875 Curtis St., Middletown, O.

ARMCO

FLEX-BEAM GUARDRAIL

North Dakota's "Worst Winter"

Notes on this state's snow removal facilities, methods and experiences during the 1947-48 "million dollar" winter

By Ray Robinson
Maintenance Engineer, N. Dakota Highway Department

SNOW removal in North Dakota is probably as tough a problem as in any place in the United States. Other localities may have heavier snowfall, but contributing factors are not as great. Our treeless prairies, almost continuous winds, and sudden changes in temperature are a great handicap. It is not uncommon to have a temperature change of as much as 60° in 24 hours; winds vary from 5 to 50 miles per hour.

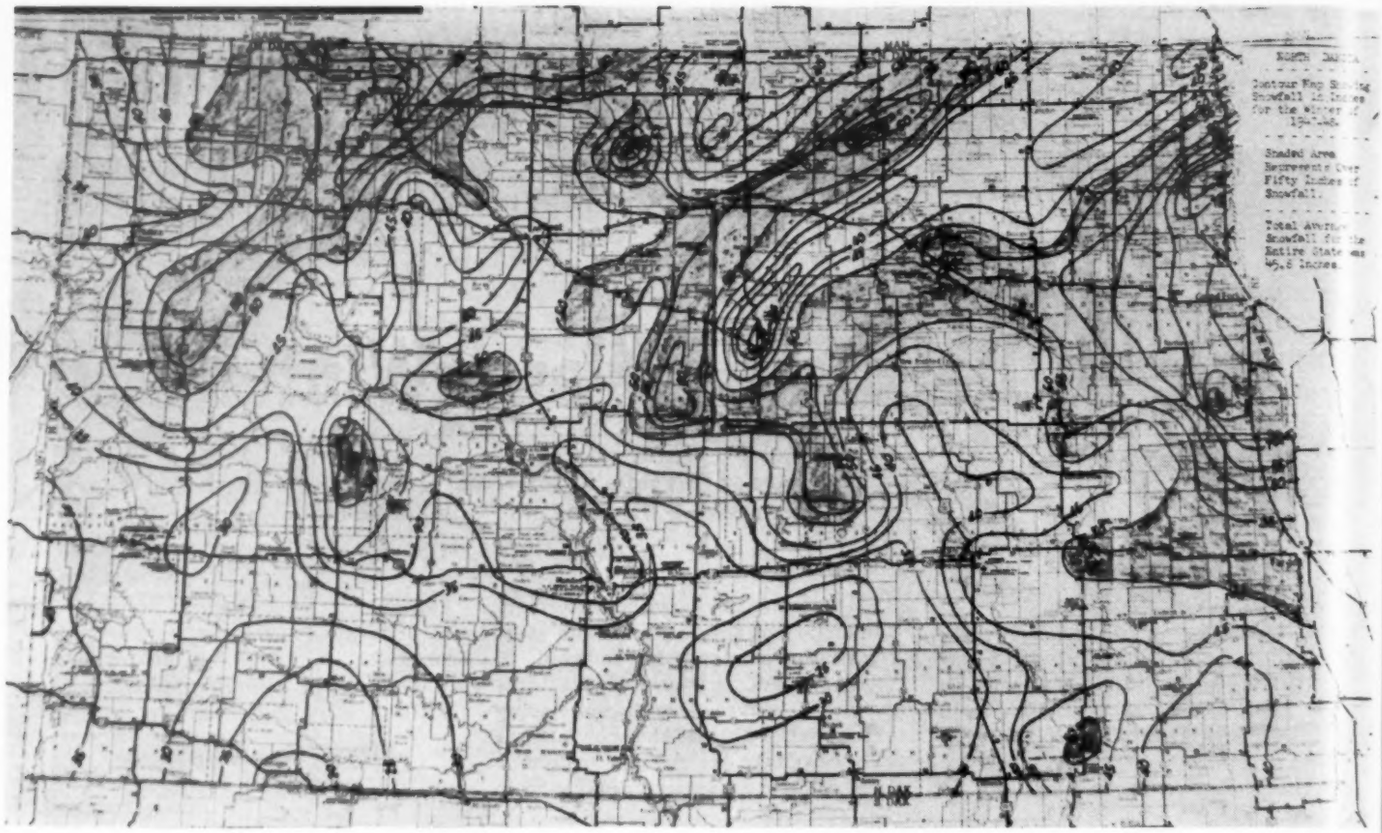
The past winter broke all records in the history of the North Dakota state highway department for snowfall. In former years, portions of the state have had heavy snowfall, but during the winter of 1947-48 the snowfall was heavy over the entire state, making it impossible to concentrate equipment in any one section.

Our first heavy snowfall was the middle of November, and the last the middle of April. The total snowfall for the season ranged from 19.5 in. to 84.3 in., with an average for the state of 45.8 in. Unusually low temperatures during this period contributed greatly to drifting, due to the fact that the snow did not melt or settle down and was therefore continually subject to drifting.

Unprecedented Expense

Snow removal and snow and ice control cost the North Dakota state highway department almost $1,000,000 during the past winter. Snow removal alone cost $817,000, which was half a million dollars more than the Department had ever spent before for this work. Prior to the past winter, the

★ Typical scenes taken last February during the "worst" winter



★ Snow map of North Dakota, winter 1947-48. Shaded areas over 50 inches. Average for season, 45.8 inches

normal budget for snow removal was $200,000.

Snow and ice control (such as the erecting and removal of snow fence, and the sanding of icy hills and curves) cost $115,000. This item remains about constant from year to year, as ice control in North Dakota is no great problem compared to states farther south where there is more rainfall during the winter months. In this state an attempt is made to sand just the hills and curves in case of icy conditions. The Department erects approximately 500 miles of snow fence each fall; in addition to this, many miles of highway are protected by making snow ridges or windrows in adjacent fields and parallel to the highway.

The following is the procedure followed for snow removal. The first snowfall of the season is usually heavy and slushy, but does not tie up traffic. Motor graders and one-way plows are put into service. If necessary, these units are followed by light duty V-type plows mounted on 1½ to 3 ton trucks traveling at speeds of from 25 to 40 miles per hour, to remove any ridges that may have been left by the motor graders and one-way plows.

These operations are continued until the snow becomes too deep for this type of equipment and may tie up traffic. At this stage, V-type truck plows make a track through in order to get traffic moving, and are followed by motor graders equipped with plows and wings for widening.

How Drifts Fought

Later in the season when the drifts range from 5 to 15 feet high, 5 to 10 ton, four-wheel-drive trucks with V-plows and rotary plows are necessary for opening the roads. The large four wheel drive truck with a V-plow is usually worked in connection with a rotary plow; the V-plow is used for opening the road, the rotary for widening. If the drifts are too tough for the V-plow, the rotary must be used for opening. This is a slow process, as when working to capacity the speed of a rotary is less than one mile per hour.

After a severe snow storm, the equipment is concentrated on the heavy traffic roads first. Heavy duty V-plows and rotaries are operated 24 hours per day when necessary.

The State highway system includes 6508 miles, with all types of surfaces including about 2,000 miles of modern streamlined highways which give us very little snow trouble. The balance of the mileage consists of low grades, very susceptible to drifting.

During the past winter many of the light-traffic roads were blocked for several weeks at a time, due to the fact that it was necessary to use all available equipment on the heavy traffic roads. Because of the continuous drifting and severe storm conditions, it was not possible to complete widening operations between storms, which aggravated the situation and made it necessary to neglect many highways. Our rotary plows were put in operation the middle of November, and continued operating until the latter part of April. During this period these units were never cold except when tied up for repairs or when forced to stop operating because of poor visibility.

The following is a list of equipment owned and operated by the North Dakota state highway department for snow removal. This represents an investment of more than $1,000,000.

14 V-type motor grader plows
11 One-way plows for 1½-ton trucks
87 V-type plows for 1½ to 3 ton rear wheel drive trucks
49 V-type heavy duty plows for four wheel drive trucks
9 Rotary "snogo" plows
13 Snow wings for four wheel drive trucks
19 Snow wings for motor graders
98 1½ to 3 ton trucks, rear wheel drive
49 3 to 10 ton trucks, four wheel drive (consisting of Marmon Herrington, Oshkosh, FWD, Walters, Coleman and International)
75 Heavy-duty motor graders

In order to have sufficient equipment to keep the entire state highway system open for traffic at all times in a winter as severe as the past one would require an additional investment in equipment of $3,000,000, with an additional cost of $3,000,000 per year for operation.

How St. Paul Keeps Its Streets

Open in Winter

By Wright S. Cockroft

Superintendent of Construction and Repair
City of St. Paul, Minnesota

SNOW plowing and removal practice in cities in northern latitudes will vary according to local conditions. One generally finds, however, that the operation is built up through years of experience so as to utilize to best advantage the organization and equipment at hand together with such additional special equipment as may be necessary.

Next in importance to having adequate equipment and a modern shop or equipment bureau for servicing and repair, is the necessity of having a trained organization familiar with the streets to be plowed and the operation of the equipment. The snow operation includes not only plowing of snow three to four months each year, but also loading and disposal of snow and ice from the business streets, removal of snow from bridges, removal of icy ruts, cindering or sanding of hills and street intersections, and opening of catchbasin inlets. The delivery of necessities and fire protection require that all usable streets be included in the plowing program. The average period of snow operations in St. Paul is from December 1 to March 15. Snowfall for the winter varies from 15 to 80 in. and for the last ten years has averaged about 40 in., of which a single ordinary maximum snowfall may be taken at 8 in.

Regular Street Force

Snow operations are under the direction of the commissioner of public works. The operating force is made up from the regular employees of the city street maintenance and street cleaning bureaus, thus giving practically continuous employment to crews familiar with the streets and skilled in the operation of the equipment. This force is further supplemented by common labor obtained through city civil service as required. Engineers of the department and the administrative staff of the Municipal Equipment and Sanitation Bureaus complete the supervisory force. The conditioning of equipment is done by the Municipal Equipment Bureau under the direction of its superintendent. The work of snow plowing is carried on as a city-wide operation from a central office at the municipal equipment building with responsible persons on duty continuously. Close contact is maintained with the local Weather Bureau office so as to receive current information as to oncoming storms and change in the nature of snow storms. Although under central control, the work of hand cleaning and cindering is done directly under the regularly employed ward foremen, the city being arbitrarily divided into ten districts for this work.

43 Blade Plows

The city has 43 straight blade reversible snow plows for mounting on various types of equipment. During the early part of November street flushers and road oil distributors are prepared for snow plowing by removing distributing bars and motors and mounting 10-ft. blade plows. The rest of the plows are mounted on city owned trucks which are used in the various bureaus of the department, such trucks being kept in service with the under frame for snow plow mounting attached. The plows can then be mounted in the short time of one-half hour per truck. Additional equipment consists of eight motor patrols with 12-ft. blades and scarifiers; a V-type plow and wing is available for mounting on one of the motor patrols when necessary; one 5-ton tractor and V-plow; and one 4-wheel-drive truck equipped with V-plow and wing.

Additional equipment for loading snow consists of four all-purpose loaders (Hough and Athey) and two snow loading machines. Although trucks are rented from private sources for cindering and snow removal, no attempt has been made in mounting plows on private trucks. The V-plows and wings are particularly valuable for coping with emergency situations of drifting snow. It is several years since we have had to use this equipment. The plows are hydraulically operated, with the lifting mechanism directly connected to the truck hoisting power.

All repair work is done in the modern shop of the Municipal Equipment Bureau, where lathes, milling machines, blacksmith shop, etc., are provided.

It is extremely important that adequate lighting for plowing equipment, both in front and in the rear, be provided. With this in view, a special blue light of distinctive appearance is placed on each side of the cab in front as high as possible, in addition to the regular truck lights, and a similar single light in the rear.

Plowing Procedure

For plowing, the city is divided into primary and secondary schedules. The primary schedule includes the business district and the more important thoroughfares; the secondary, the balance of the city. Attention is concentrated on the early completion of the primary schedule, although at times some work is done on secondary streets simultaneously. As snow plows are dispatched from the equipment yard, each operator is furnished with a typewritten schedule of streets to be plowed. For primary streets, a fixed order of plowing is required, while on the secondary street, a section or area is given in the form of a map.

- **Adequate equipment, a modern shop, trained organization, essential to doing a good job.**
- **Regular year-around street force employed.**
- **Blade plows do most of work; V-plows and wings vital in emergencies.**
- **Mechanical loaders indispensable in business districts.**
- **Cinders better than sand.**
- **Force gives careful attention to use of warning lights on trucks.**
- **Tow trucks for parked or stalled vehicles increasingly important.**

Each crew is manned by a truck driver and one helper. Operators are required to report their progress by telephone on approximately a 4-hour schedule. Plowing is ordinarily begun as soon as the snowfall reaches about 4 inches. The snow is plowed as close to the pavement or street surface as possible, the plows being set to clear at about 1 inch. Plows are operated in echelons of two or three, three plows being used on the wider streets and two on the narrow streets, generally making it possible to complete the plowing operation in one trip on each side of the street.

A special gas truck is kept on duty to supply the units with gas and oil. The truck operator telephones in for this service about two hours in advance of the time that gas will be needed. Towing service is kept available for bringing in equipment for repair that cannot come in on its own power.

There are about 210 miles of streets in the primary schedule, and slightly over 500 miles in the secondary schedule. Alleys are not plowed because it is felt that the blocking of entrances to garages would cause more trouble than the benefits received.

Snow fences are utilized in the open, outlying districts to localize drifting at some distance from the roadway. The lighter 1½-ton trucks have proved to be particularly effective for light snows and for cleaning up of intersections or where quick operation is required. However, during the past five years we have disposed of the 1½-ton trucks and gone into the 2- or 3-ton class for all-around service.

Loading and Disposal

The removal and disposal of snow in the loop business district and various outlying business sections is organized on a day-and-night basis. On account of traffic it is necessary that removal of snow in the loop district be done at night. This work is started at 11:00 o'clock and continues until about 8:00 A.M., when traffic begins to get heavy. In advance of loading, the snow is plowed into windrows next to the curb at each side of the street with motor patrols or heavier plows.

The snow is then loaded into trucks by means of Sno-Gos or Athey loaders and dumped into the sewers through two special snow chutes. These chutes are supplied with a large water connection so as to prevent plugging of chutes and sewers with snow.

By means of radio and the daily papers, the public is advised of the streets on which snow is to be removed and requested to keep cars off the street. However, at times motorists are not too cooperative, and we always have a tow car available. It is necessary that snow from the loop business district be removed within two or three days after plowing, otherwise it becomes compacted to such an extent that it is difficult to plow it into windrows.

Bridges are plowed along with the streets on any given route and the actual removal of snow from the bridge roadway and sidewalks is accomplished either by loading or by shoveling it over the bridge railing by hand.

Hand labor is used for cleaning intersections immediately after each storm so that the crossings are open for pedestrian travel.

While snow plowing and removal are of prime importance, the control of ice is becoming more and more important. We sometimes find that although we do very little snow plowing in any particular month, considerable money is spent on taking care of conditions caused by sleet or light snowfalls. Considerable trouble is experienced with snow forming into ruts, especially after heavy snow storms. Even after light falls, ridges develop along the street car rails and it is necessary to use the motor patrols to break up this ice and either plow it to the side or remove by loading.

It is particularly necessary to protect traffic from icy surfaces on grades and at street intersections, and the only feasible means of combating this is by the use of cinders, sand, calcium chloride or salt, or a combination of these materials as the condition may require. We have been fortunate for several years in being able to obtain all the cinders needed for this purpose. It is our opinion that the cinders do a better job than sand. Cinders are collected throughout the year and are crushed at our central yard before and during the winter season. The cinders are distributed at various points throughout the city so as to speed up distribution when the rush is on for their use.

Calcium chloride is mixed with the cinders at the rate of 75 lb. per cu. yd. during extremely cold weather as this assists in holding the cinders on the streets. Cinder spreading is carried on by means of four front-end, truck-mounted spreaders and also by hand with two men on each truck in addition to the driver.

Appropriation

Funds are provided for snow removal in the regular city budget prepared by the city comptroller and approved by the city council each year. Although the available annual fund for snow plowing and removal costs about $150,000 to $175,000, the regular city budget provides only about one-half of this amount and it is necessary to make up the balance by emergency authorization as necessity arises. The cost of snow plowing and removal from the street railway track area is charged to the St. Paul City Railway Company, on a pro rata basis depending on street width. A rental charge is made against the snow cleaning fund for all city equipment used. The rental charge covers depreciation and repairs, the depreciation charge being sufficient to provide for replacement of equipment.

Milton Rosen is commissioner of Public Works; Wright S. Cockroft, superintendent of construction and repair; Arthur H. Koch, director, bureau of municipal equipment; George M. Garen, assistant superintendent of construction and repair; and John M. Cotter, superintendent of sanitation. Direct supervision of snow plowing and removal and ice control is under the superintendent of construction and repair and the superintendent of sanitation.

The Ultimate Particles

(*Continued from page* 74)

At the close of his article in *Scientific American* Gray says: "Many physicists are frankly dissatisfied with the complexity of the nuclear theory. There is a song going the rounds of the laboratories which expresses some of the bewilderment that confronts those who experiment with and meditate on the new-found particles. . . . The Meson Song ends with the refrain:

> What? No sense at all?
> No! No sense at all.
> A very small rest mass,
> And no sense at all."

"I do the very best I know—the very best I can; and I mean to keep doing it until the end. If the end brings me out all right, what is said against me won't amount to anything.

If the end brings me out wrong, ten thousand angels swearing I was right would make no difference."

Framed on office wall of Nelson F. Pitts, city engineer, Syracuse, N.Y.

Florida Road Men Go to School

Under Unique Cooperative Personnel Training Program

By Radnor J. Paquette
Assistant Professor of Civil Engineering, University of Florida, Gainesville

FIFTEEN members of the engineering staff of the Florida state road department have completed the first of a series of 12-week courses, held at the University of Florida under the sponsorship of the department of civil engineering. This cooperative training program is believed to be the first of its kind in the United States.

Florida like many other states, has had difficulty in carrying out its tremendous post-war highway program because of the lack of a sufficient number of adequately trained engineering personnel. The increase in private construction activity, along with that in other forms of public work, has led to open competition for the services of the professional and sub-professional personnel required for completion of the state highway program.

Train Present Personnel

Faced with this difficulty, officials of the road department conceived the idea of effecting a partial solution to the problem by amplifying the professional training of men already in its employ. It was felt that such training would increase the general effectiveness of professional and sub-professional personnel, and result in a higher level of professional activity within the department.

With this thought in mind, the idea of the cooperative training program was established. The objective of the training program is to train, over a period of years, virtually all the engineering personnel of the state road department, from the grade of rodman up through that of assistant division engineer, in nearly all phases of highway design and construction. It is hoped that the individual employee will be able to attend a sufficient number of courses to permit him to become a Registered Professional Engineer.

Early in 1948 announcement was made through the division engineers to all engineering personnel. Some 90 employees signified their interest in the program.

It was realized that those interested came from all engineering grades, and that they varied greatly in age, education and engineering experience. It was therefore decided to give a classification or "screen" test to those interested to supplement their personnel records, and to permit division of the large group into smaller groups of similar education, experience and professional ability. Thus it could be assured that each group receiving training would derive the maximum benefit from the instruction given.

The screen test itself contained some forty problems and questions, and was designed to be taken without the use of reference books. Included in the test were a number of mathematics problems, ranging from simple arithmetic through calculus; problems in mechanics, both static and fluid; and questions covering various aspects of highway engineering. One day was allotted to the completion of the test.

"Screen" Tests Given

Answers to the test questions were then carefully evaluated by members of the university civil engineering staff. As was expected, there was a wide range in the total score of the individual tests. It was interesting to note that the results of the screen test seemed to be consistent with the factors of age, education and experience, and proved to be a great help in selecting groups for training.

Careful evaluation of the screen test and personnel records led to the selection of those to be included in the first group. In general, these men were selected from the group having the highest score in the screen test. Men selected included draftsman, designers, project engineers and others in comparable positions.

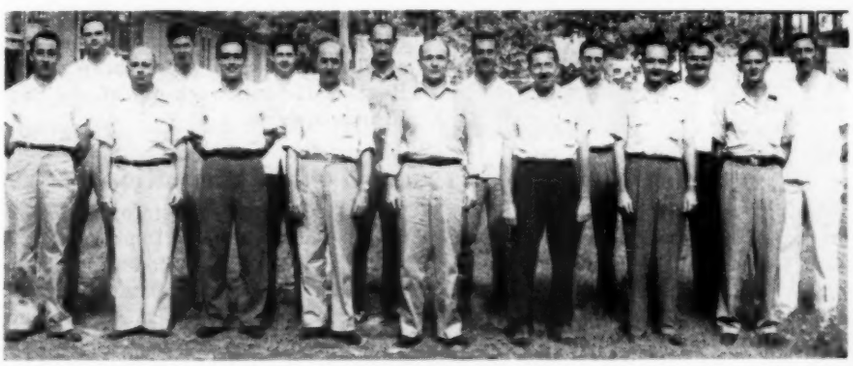
After considering its own organizational needs, the road department finally selected fifteen men for the first course, and instruction of this group began on June 2, 1948. The department continued to pay individual salaries of the men in training, plus a per diem allowance.

The first course included instruction in mathematics, elementary soil mechanics, elements of highway planning, location and design, bituminous materials and bituminous paving mixtures, and elementary mechanics. Interest in the work was above that expected and officials of the University have complimented the members of the first group for their attitude toward the short course and the volume of work covered during the 12 week period.

The training course is directly under the writer, who taught most of the course, and L. J. Ritter, associate professor of civil engineering, with C. D. Williams, head professor of civil engineering, having over-all supervision. A second group of trainees was expected to begin receiving instruction late in September.

New Jersey Toll Road Awaits Governor's O.K.

As we go to press a bill to create a New Jersey Turnpike Authority has passed the legislature and awaits the Governor's signature. First project for the authority is an 85-mile toll highway that will extend from the new Dupont Bridge across the lower Delaware River to Woodbridge in central New Jersey, where it will connect with Route 100 which leads to New York City. Under the measure, S. 373, credit of the state cannot be pledged against the turnpike authority's bonds.



★ Trainee squad of past summer. Prof. Paquette at extreme right

WITH THE MANUFACTURERS & DISTRIBUTORS

Named District Manager

C. M. Gegenheimer has been named district manager in charge of the Chicago office of Marion Power Shovel Co., Marion, O. He succeeds David E. Rizor, who has been transferred to the company's home office. Mr. Gegenheimer comes to the Chicago position after two years as district manager in charge of Marion's St. Louis office. His successor at St. Louis is A. W. McGraw. Marion's Chicago office is located in Room 1963 McCormick Building, 332 South Michigan Ave.

C. M. Gegenheimer

Euclid Promotes Cantrell

Thomas A. Cantrell, formerly field engineer in the Sales Development Dept. of The Euclid Road Machinery Co., Cleveland, O., has been appointed district manager for western New York and the Canadian Provinces of Ontario and Quebec. Mr. Cantrell was with the Georgia Dept. of Public Health prior to serving as Major in the Engineer Corps during the war. He is a graduate of Georgia Tech and the University of Michigan where he received his Master's degree in Engineering.

Conway Promoted by Koehring

John S. Conway, formerly export sales manager for the Koehring Co., Milwaukee, Wis., has been appointed general sales manager. At the same time, Koehring named John E. Chadwick assistant sales manager and R. E. Stewart export sales manager. In his new post, Conway succeeds J. F. Robbins who will become president and general manager of the Capitol Equipment Co., a Koehring distributor in Harrisburg, Pa.

J. S. Conway

New "Caterpillar" Distributor

The Inland Machinery Co., LeGrande, Ore., has been appointed a distributor of "Caterpillar" products of Caterpillar Tractor Co., Peoria, Ill., in five eastern counties of Oregon. The new distributorship is headed by Robert R. Carey as President, J. Donald Steinbeck and C. E. Millering as Vice-Presidents and W. Ned Jones as Secretary-Treasurer and will have offices at 212 Greenwood St. in LeGrande. The organization will serve the counties of Baker, Union, Wallowa, Grant and Harney in Oregon—territory formerly served by Bunting Tractor Co., which retains as its territory 19 counties of Idaho and Malheur County, Oregon.

Gar Wood Appointments

John W. Blood has been appointed division service manager, Findlay Division of Gar Wood Industries, Inc.

J. D. Blood

G. S. Ames

Mr. Blood came to Gar Wood Industries, Inc., in April, 1943, as a draftsman, and later became product engineer for the Buckeye line. George S. Ames has been appointed special representative of the service department of the Findlay Division. He will be on call to assist pipeline contractors on service and parts problems. He was associated formerly with various oil field contractors.

Service Representative Named

Byron D. Mathews has been appointed service representative for the Northwest Region for Findlay Division of Gar Wood Industries. He will work out of Boston, Mass., office. Harry H. Smedley has been appointed service representative for the Western Region. He will work out of the San Francisco office.

Atlas Promotions

R. K. Gottshall, heretofore director of sales of Explosives Department of Atlas Powder Co., Wilmington, Del., has been appointed assistant general manager. W. E. Collins, Jr., former manager of the Seattle., Wash., Sales District, succeeds Mr. Gottshall as director of sales. Both will have headquarters at the general office in Wilmington. George W. Thompson, special representative, New York Sales District, has been transferred to Seattle as manager of that District Sales Office with headquarters in the Joseph Vance Building, Seattle.

E. K. Green Promoted

Edward L. Fuller, President of International Salt Co., Inc., has announced the appointment of Edson K. Green as general sales manager of the company. Mr. Green has been assistant sales manager since 1945 and prior to that time served as the company's New York City district manager. He has been with International Salt Company, Inc., since 1929 and lives in Scranton, Penn., where the company's main office is located.

E. K. Green

Elected Vice President

Whitley B. Moore has been elected vice president in charge of sales for The Timken Roller Bearing Co., Canton, O. He succeeds L. M. Klinedinst, who after 43 years of service retired under the company's annuity plan in effect for the past several years. Moore after graduating in 1919 from the University of Michigan's Engineering School served in the Navy. When he came with the company he was first assigned to Factory Equipment Engineering and later was transferred to the Pacific Coast in charge of sales and engineering for all territory West of the Rocky Mountains. Later he was moved to Canton as assistant general manager of the Industrial Bearings Division and later became manager of that division. During World War II Moore had charge of their Steel Sales Division and about three years ago was appointed director of all sales. Mr. Klinedinst will remain a director of the company and further serve as sales consultant.

Joins Byers

Kenneth E. Sabine, well-known Cleveland advertising man since 1937, has joined the staff of The Byers Machine Co., Ravenna, O., as assistant sales manager in charge of advertising and sales promotion. Mr. Sabine has been assistant advertising manager for Jack & Heintz Precision Industries, Inc., Cleveland, since his discharge from 5 years' duty with the Army Air Force in 1945.

Staben Appointed District Manager

Melvin A. Staben has been appointed district manager for all industrial business conducted by the Oliver Corporation in the states of Oregon, Washington, Idaho and Montana.

M. A. Staben

In his new capacity, Mr. Staben will supervise the company's industrial activities with distributors. His headquarters will be The Oliver Corporation offices, 130 S. E. Morrison St., Portland 14, Ore.

Ebberts Rejoins Madsen

Don Ebberts, who first became associated with Madsen Iron Works, Huntington Park, Calif., in 1938, has rejoined the company as national sales manager for the Madsen road construction equipment. For several years, Ebberts held the post of advertising director with the Madsen firm, but left in 1943 to become associated with one of the successful advertising agencies of Los Angeles. He now returns to direct all national sales activities for Madsen asphalt paving plants, Madsen road pugs, Johnson float finishers and other construction equipment of the Madsen line.

D. Ebberts

Appointed District Sales Manager

Ralph L. Wolf, formerly executive secretary of the Ohio Department of Highways, has been appointed central district sales manager for Buffalo-Springfield Roller Co., Springfield, O. Mr. Wolf, whose present address is Columbus, O., will cover seventeen central and southern states for this company and will assist the Buffalo-Springfield distributors in that territory in the sales and service of Buffalo-Springfield rollers. His training and background provide an excellent foundation for the new responsibilities. George P. White and John P. Griffin, Eastern and Western District Sales Managers respectively, who have formerly covered portions of the Central District, will now concentrate their entire attention on their respective territories.

R. L. Wolf

Worthington Promotes McBath

B. R. McBath, formerly assistant to the president of Ransome Machinery Co., Dunellen, N. J., has been named general manager, succeeding William H. Scherer, whose retirement became effective July 1st. Mr. McBath was transferred to Dunellen from Worthington's Harrison Works, in April of this year, where for 20 years he was in charge of various engineering activities, and finally as chief engineer of the Research and Development Department.

B. R. McBath

Madsen Buys Johnson Patents

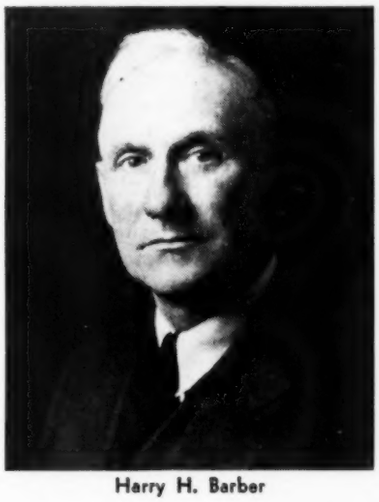
Complete acquisition of the Johnson float finisher patents by the Madsen Iron Works, Huntington Park, Calif., has been announced by Martin Madsen, President. This mechanical float finisher will be known henceforth as the "Madsen-built" Johnson float finisher and manufacturing will be carried on only at the Madsen West Coast plant. In recent years, Madsen has had exclusive western sales and manufacturing rights of this equipment in the eleven Western States. A national sales program designed to build a strong Madsen dealer set-up will get under way immediately. Dealers interested in exclusive representation should write immediately.

Harry H. Barber Dies

Harry H. Barber, Chairman of the Board of Barber Greene Co., Aurora, Ill., manufacturers of bituminous road building equipment and material handling machinery, died Sept. 6. He had been in failing health for several years. Mr. Barber, one of the pioneer designers of modern construction equipment, retired as president of the company on Sept. 25, 1945 to become Chairman of the Board. He would have been 71 on Jan. 18.

After receiving his M.E. degree in 1907 from the University of Illinois, Mr. Barber was employed by Stephens-Adamson Mfg. Co., Aurora, Ill., and worked chiefly in the Engineering and Sales Engineering Departments.

In 1916 he formed a partnership with William B. Greene, who also had been with Stephens-Adamson. D. G. McIlwraith joined the company a few months later, and in 1917 the company was incorporated under its original name—Barber Greene Co. The first Barber-Greene machine, a portable belt conveyor, was finished in the fall of 1916. This belt conveyor was the first of a line of new creations which Harry Barber thought out and sweated out during the ensuing years. The portable belt conveyor was followed by the self-feeding bucket loader in 1917, which became a semi-crawler



Harry H. Barber

machine in 1919 and a full crawler mounted unit in 1920. First experiments on the vertical boom Barber-Greene ditcher were started in 1920, and real production began in 1924.

In 1920 Harry Barber brought out the first snow loading machine ever built. The portable flight conveyor came into being in 1923. He spent the remainder of the '20's improving the designs, and expanding the line.

The 1930's were probably the most spectacular and significant years of Harry Barber's creative career. It was during this period that he conceived and developed entirely new machines and methods for bituminous road, street, and airport construction.

The first experimental Barber-Greene asphalt traveling mixing plant and finishing machine was used on a paving job near Rollo., Mo., in 1930. The mixing plant was followed by the development of new auxiliary units for bituminous construction. These included portable machines for drying the aggregates; and ingenious gradation control units which sepaated the sand, gravel, and other aggregates into the desired sizes, and automatically measured out the correct quantity of each size for the mixer. The dryers came in 1937, and the gradation control units in 1939.

(*Continued on page* 116)

Day Labor Increases Cost of Airports

By Walter R. Macatee
Manager, Airport Division
American Road Builders' Association,
Washington, D. C.

UNCLE Sam is strongly opposed to "buying a pig in a poke" in his big Federal-aid airport development program. To prevent just that, the Civil Aeronautics Administration's regulations strictly forbid the accomplishment of airport construction through the use of local airport sponsors' force account unless it is first determined that the use of day labor can be more effective and more economical than employing the contract system, and closely supervising all contracts. Even if an exception to this regulation is approved, it is done so only in instances where well-defined limitations are stipulated in agreements made between the government and the sponsor of a public airport on which Federal-aid funds are used.

Nevertheless, sponsors of airport projects frequently state that they can accomplish necessary construction more satisfactorily if they are allowed to do the necessary work with their own forces. They often urge force-account methods rather than resorting to the usual plan of awarding work to responsible contractors. They do this in the false belief that it effects economy. However, experience in road building reveals that highway development accomplished by contract under strict engineering supervision, as against force account methods, effects the greatest economy.

Airport Work "Heavy"

Advocates of the force-account system counter this claim, and attempt to make the point that highway work differs from airport development. But, does it? The Civil Aeronautics Administration's breakdown of estimated cost of airport development, exclusive of administration buildings and hangars, shows that clearing, grubbing, drainage and paving operations required in accomplishing an airport's development accounts for 90% of its cost. Therefore, the contention offered that the two types of development present wide variations is not borne out. This is for the reason that these same operations constitute the major cost of developing highways.

During the great depression local highway authorities endeavored to carry out road development in a manner which might provide the greatest possible employment of local labor without, however, adding expense to over-burdened taxpayers. Many such officials felt that the force account system could be depended upon to provide both of these desirable qualities, greatest employment of local labor, and effecting economy for taxpayers.

Advocates of the two work forms had no dogmatic, hide-bound feelings about the matter. So . . ., in order to get a reasonable measure of the relative efficiency of the contract and force-account systems, officials in charge of the Public Works highway construction program of 1933, required that each state undertake to construct one or more sections of highway with forces employed directly by the state. This was to determine the relative economy and efficiency of force-account, comparing it with similar work carried out under the contract system. Results: 46 states constructed 53 sections of highway that were considered to be representative. These were bid upon by contractors in the usual manner. The work was later withdrawn from contract, and was actually done by day labor adhering as closely as possible to standards required for contract work.

Contract System Best

As a result of studies made possible through the construction of these 53 projects accomplished by day labor methods, comparing the results with similar work carried out by contract, the contract system was found to be more efficient. The total cost of constructing the 53 projects by force-account was approximately $4,000,000 for 244 miles of highways involving the usual items which make up highway cost. This was an increase of $593,000 over the total of bid prices submitted under the contract system. In other words, force account methods of accomplishing the same volume of work was 18% more costly when carried out by day labor than if it had been done by contract.

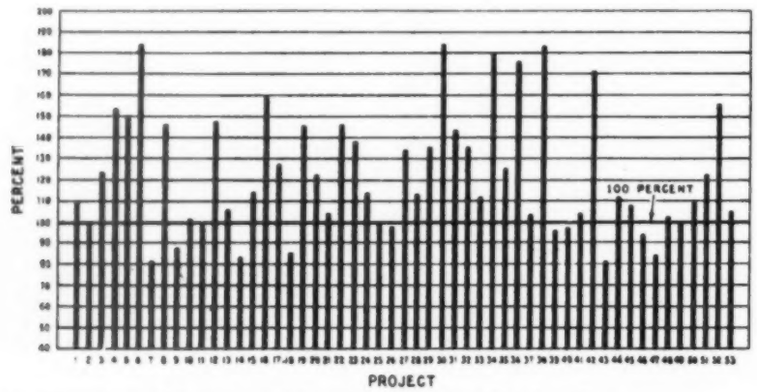
More interesting perhaps than was the wide difference in cost were the comments received concerning the efficiency of the jobs' management. Eighteen reports stated that inefficiency obtained; two reported inefficiency, and undue outside interference was the rule. In other words, politics entered into these matters. On the plus side, four reports noted efficiency.

On 75% of the projects, the cost by day labor methods exceeded the bid prices by 31%. On the other hand, nearly 25% of the projects were constructed for less than bid prices submitted for accomplishing necessary construction by the contract system. However, as already shown, the overall average cost of the 53 projects demonstrated that the force-account method was 18% more expensive.

The Commissioner of Public Roads, in testifying before Congress on these experiments, said:

"There is no question about the quality of work performed, and the increase in cost is not an entirely fair comparison, because the states were not operating this method (force account) on a large scale. However, there is no question about the relative economy of contract work versus force-account work under supervision of public bodies. The principal reason, I think, is that it is very difficult to get the same loyalty and performance from either material suppliers or employees on the job, to the public, as the contractor can secure."

Thus, it is obvious that competitive methods which require the use of modern equipment and materials are far more effective than day labor methods and hand tools in accomplishing airport and highway development.



★ Comparison of Contract and Force Account Costs Based on Contract Cost being 100%

Road Maintenance Costs

They've risen 86% since 1935; 8% in past year

By S. E. Ridge
Maintenance Division, Public Roads Administration, Washington, D.C.

THE present cost of maintaining and operating our national system of highways is over 8% higher than in 1947. The index now stands at 186.4. The trends of labor, material, equipment and overhead costs, obtained by the methods described in the December 1947 Progress Report of the Project Committee on Maintenance Costs of the Highway Research Board, are all well above the 1947 level.

Average maintenance labor rate has risen about 7% to an all-time high of 2.2.7. Average hourly rate for common labor, $0.365 in 1935 is now $0.785, an increase of 115%. Average rate for all maintenance labor, including common, skilled, operators, patrolmen and foremen, is now $0.883, an increase of 113%.

Bituminous Materials Up

Average cost of maintenance materials is 11% higher than in 1947, an extension of the sharp rise in material prices that became evident in 1946. A large part of this increase is due to the recent rise in the cost of liquid bituminous materials. This one item has increased a little over $0.02 per gallon, or 21%, since 1947. Other material items, with the exception of paint, have increased. Paint showed a marked decrease due, in all probability, to the general decrease in the price of paint and paint ingredients. The maintenance material cost index is now 161.2.

Average equipment rate has increased 12%. This is due, primarily, to the acquisition by the states of new and higher priced equipment. This, of course, necessitated an increase in the dollar value of depreciation rates. At the same time equipment maintenance labor rates, replacement parts prices and fuel costs have increased. These further increased the cost of operating both the old and the new equipment. Maintenance equipment rental index, now 171.6.

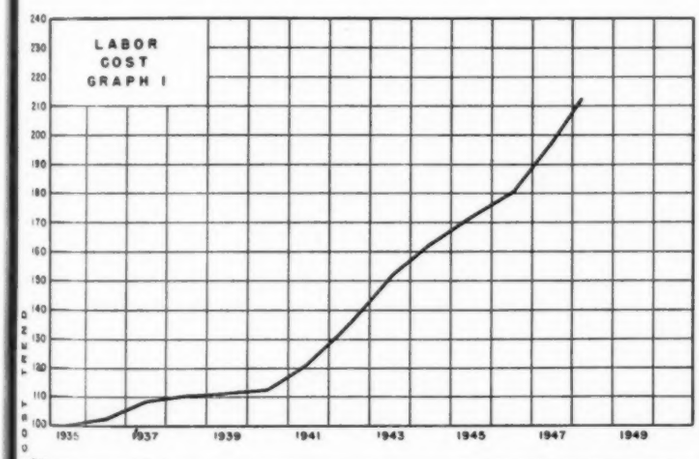
The overhead cost index has risen only 5% since 1947. This rise is due to the wage and salary increases and cost-of-living bonuses granted by about half the states. It should be noted that this overhead item includes the salaries of clerks and stenographers, watchmen, etc., as well as engineering personnel. The index does not, therefore, represent the increase in engineering salaries. These have, in fact, been increased much less.

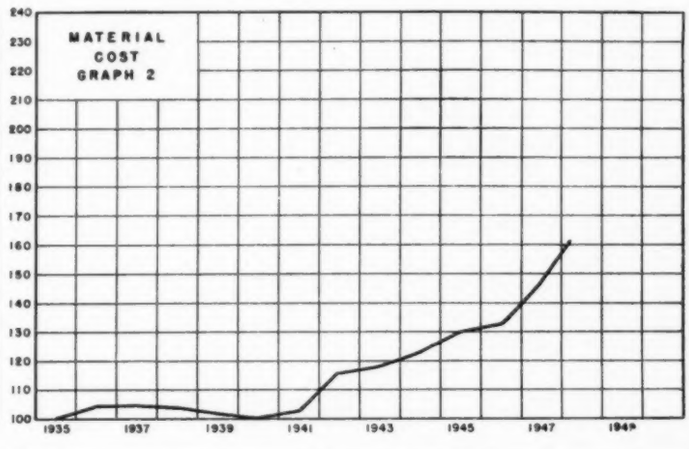
It will be noted that there has been a slight increase in the rate of rise of all the cost trends except overhead. It is believed that this is not as serious as it first appears to be, since this index for the first half of 1948 contains the greater part of the increase for the full year. This is due to the policy in effect in many states of contracting for a full year's supply of one commodity at one letting. It is, therefore, expected that the index for the last half of 1948 will be higher than the present index, but that the increase will not be as great as the increase from 1947 to the first half of 1948.

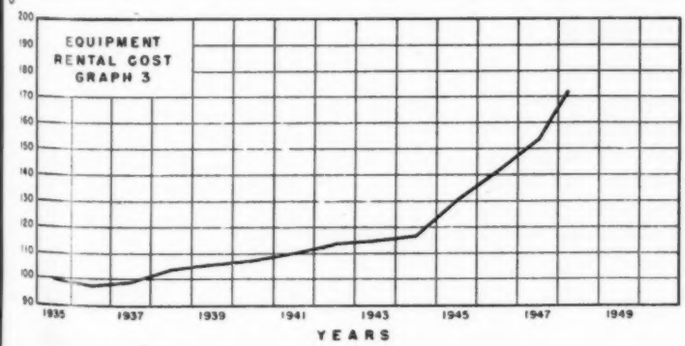
The effect of this increase in costs is shown in the following example. The average cost of maintaining and operating the Nation's state highway system in 1935 was $403 per mile. The cost of these same units of labor, material and equipment in 1940 was $436 and is now $751, 86% above the 1935 level.

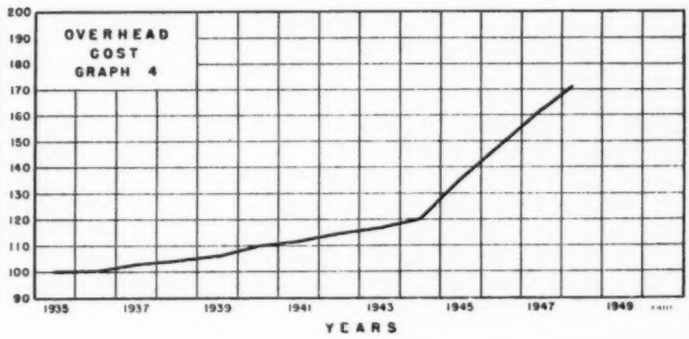
Cost Trends—Highway Maintenance and Operation

Year	Labor	Material	Equipment	Overhead	Total
1935	100.00	100.00	100.00	100.00	100.00
1936	102.19	104.31	97.97	100.29	101.24
1937	108.48	104.42	99.31	102.50	104.46
1938	110.17	103.73	103.51	103.97	106.36
1939	111.29	101.64	105.87	105.83	107.23
1940	112.33	100.30	107.12	110.20	108.13
1941	121.16	102.86	110.11	111.33	113.30
1942	134.93	115.68	113.27	113.93	122.83
1943	151.82	117.76	114.46	116.87	130.88
1944	162.42	123.22	116.77	119.81	137.34
1945	171.16	130.10	129.89	135.01	147.52
1946	180.56	132.62	141.28	148.30	156.40
1947	198.40	145.83	153.39	162.38	171.28
1948 (First ½)	212.74	161.20	171.60	170.42	186.42









F.A. Apportionments Made for Fiscal 1950

AMOUNTS apportioned to the states under the 1948 Federal-aid Highway Act were announced today by the Public Roads Administration. The Act under which the apportionments are made provides a total of $450 million aid for each of the fiscal years 1950 and 1951. The apportionments for fiscal 1950, which follow, become available next July 1 and remain available until June 30, 1952.

Total authorizations are divided by the Act into three groups—(1) 45% for projects on primary roads in the Federal-aid system; (2) 30% for Federal-aid secondary roads, and (3) 25% for Federal-aid in urban areas having a population of 5000 or more. State percentages for each group vary in accordance with differing areas, population and post-road mileages.

These are the apportionments which the states must generally match:

State	Sums Apportioned for Fiscal Year 1950 for Federal-aid Primary System	Secondary or Feeder Roads	Urban Highways	Total
Alabama	$ 4,234,466	$ 3,347,912	$ 1,157,921	$ 8,740,299
Arizona	2,883,981	1,994,406	232,926	5,111,313
Arkansas	3,437,818	2,765,905	495,958	6,699,681
California	8,025,813	4,595,138	7,216,292	19,837,243
Colorado	3,583,930	2,411,757	829,510	6,825,197
Connecticut	1,240,162	681,025	2,316,659	4,237,846
Delaware	974,531	649,688	181,297	1,805,516
Florida	2,894,455	1,938,785	1,421,220	6,254,460
Georgia	5,026,124	3,834,698	1,441,091	10,301,913
Idaho	2,478,367	1,733,203	188,176	4,399,746
Illinois	7,812,450	4,198,769	8,449,887	20,461,106
Indiana	4,762,317	3,193,419	2,723,787	10,679,523
Iowa	4,916,913	3,516,275	1,414,525	9,847,713
Kansas	4,973,808	3,493,343	983,721	9,450,872
Kentucky	3,765,200	3,045,891	1,154,581	7,965,672
Louisiana	3,036,036	2,270,096	1,360,748	6,666,880
Maine	1,721,234	1,240,539	498,017	3,459,790
Maryland	1,632,747	1,043,969	1,590,418	4,267,134
Massachusetts	2,614,477	698,824	5,875,054	9,188,355
Michigan	6,058,649	3,663,939	5,048,623	14,771,211
Minnesota	5,356,784	3,690,493	1,960,081	11,007,358
Mississippi	3,649,214	3,001,136	533,179	7,183,529
Missouri	5,909,105	4,048,164	2,799,683	12,756,952
Montana	4,048,884	2,766,121	273,348	7,088,353
Nebraska	3,954,543	2,791,999	695,466	7,442,008
Nevada	2,564,998	1,718,707	53,853	4,337,558
New Hampshire	974,531	649,688	422,019	2,046,238
New Jersey	2,547,207	927,053	4,911,404	8,385,664
New Mexico	3,234,379	2,238,846	228,567	5,701,792
New York	9,615,348	3,788,591	16,681,818	30,085,757
North Carolina	4,867,144	3,983,477	1,326,007	10,176,628
North Dakota	2,951,523	2,127,843	190,644	5,270,010
Ohio	6,967,252	4,101,078	6,698,622	17,766,952
Oklahoma	4,484,445	3,294,834	1,197,791	8,977,070
Oregon	3,330,486	2,272,391	720,430	6,323,307
Pennsylvania	8,156,836	4,679,791	9,344,128	22,180,755
Rhode Island	974,531	649,688	997,786	2,622,005
South Carolina	2,724,022	2,246,419	581,082	5,551,523
South Dakota	3,114,552	2,217,687	197,342	5,529,581
Tennessee	4,266,287	3,278,719	1,415,352	8,960,358
Texas	12,679,694	8,930,900	3,966,153	25,576,747
Utah	2,259,221	1,504,566	385,353	4,149,140
Vermont	974,531	649,688	188,251	1,812,470
Virginia	3,657,445	2,836,866	1,324,938	7,819,249
Washington	3,145,271	2,129,619	1,303,754	6,578,644
West Virginia	2,211,489	1,857,176	717,603	4,786,268
Wisconsin	4,802,731	3,253,279	2,358,393	10,414,403
Wyoming	2,474,161	1,679,067	118,209	4,271,437
Hawaii	974,531	649,688	349,535	1,973,754
Dist. of Columbia	974,531	649,688	1,018,601	2,642,820
Puerto Rico	987,096	1,006,657	741,447	2,735,200

New Maintenance Manual

Highway maintenance men throughout the United States have an important new guide and reference in the release of the 98-page manual "Policy on Maintenance of Roadway Surfaces" by the Association of State Highway Officials. As with other policy manuals, this one is the result of extensive committee work. It was published following approval last winter by all the organizations concerned prior to which it had been submitted for letter ballot and approved by the chief executives of 46 state highway departments and the Public Roads Administration.

The manual covers soil-aggregate surfaces, bituminous surfaces, portland cement concrete surfaces and block pavements. The manual is on sale at AASHO headquarters. Those interested should remit $1.00 to the American Association of State Highway Officials, 1220 National Press Building, Washington 4, D. C.

Tar Soil Stabilized Base Courses

(*Continued from page 79*)

Prior to laying the base course, the compacted sand subgrade was primed with about .28 gal. of RT-2 per sq. yd. After the prime coat had properly cured, the subgrade was rolled with a pneumatic-tired roller to consolidate the surface.

The hot-mix tar-sand base course was constructed 4½ in. in compacted thickness laid in two courses, composed of mixture of local sand and RT-12.

A hot-mix tar-surface course was placed on the base course 1½ in. thick.

The analysis of the surface and base course mixture was as follows:

Sieve Size	Base Course Per Cent Passing	Surface Course Per Cent Passing
½"		100
#4	100	84.3
#10	99.6	68.7
#40	78.8	50.0
#80	41.9	27.5
#200	9.9	8.6
Bitumen %	5.1	5.5

Conclusions

In view of the findings of the ARBA Committee on Tar Stabilized Roads and the experience of the Corps of Engineers with tar-sand stabilized base courses on the airfields previously mentioned, it is believed that the following conclusions are justified:

1. The use of tar-soil stabilization should be considered for base courses where economy may be effected and the soil indicates suitability.

2. Good performance may be expected from soil-tar stabilized base courses provided the soil possesses proper characteristics.

3. Soil-tar stabilization should be considered only for that portion of a flexible pavement considered to be the base course.

4. Properly designed and constructed tar-sand stabilized base courses of adequate thickness have given satisfactory performance on military airfield runways.

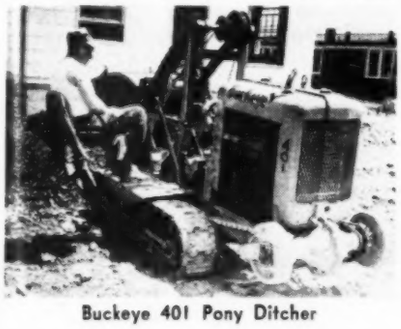
Clearing House Section 9 Pages This Issue

Eighty individual advertisers feature an exceptionally large selection of used equipment in the 9-page "Clearing House" section which starts in this issue on page 121. Readers will find the "Clearing House" a dependable and informative directory of outstanding values in used equipment and we suggest that you make perusal of these pages a regular habit each month. At any time that you have equipment you wish to sell, anywhere in the country, we suggest that you present your offerings in our "Clearing House." This section is growing faster, getting larger every month, because it's doing a better, quicker selling job—at one low cost!

New Construction Equipment and Materials

1
Trenching Machine

A new ditcher added to the Buckeye line of Gar Wood Industries, Inc., Findlay Division, Findlay, O., cuts a trench as narrow as 6 in. wide. Digging buckets for 8 in. wide trench are available. The unit digs to a 4 ft. depth. It weighs 6,580 lb., and is powered by a 47 h.p. (at 1600 r.p.m.)



Buckeye 401 Pony Ditcher

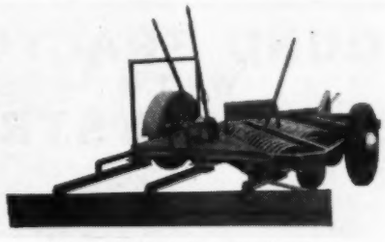
industrial gasoline engine. Maximum length is 13 ft. 9 in., and width is 4 ft. 4 in. The excavator boom is all welded steel box type and is raised and lowered by means of self locking worm hoist, powered directly from engine transmission. Spoil is discharged to both sides of ditch. Crawlers, driven from forward by heavy truck type differential, are non-clogging and have cast alloy steel treads. Left side crawler is adjustable vertically so that machine can maintain an "even keel" and dig a vertical ditch when operating along a slope or with one crawler on a curb.

2
Arc Welding Electrode

A new low-hydrogen type coated electrode designed to prevent underbead cracking in weld deposits has been announced by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N.Y. The new electrode will be known as Airco No. 394. This new electrode operates on either AC or DC and is designed to give welds of 100,000 psi. It is anticipated that the electrode will find a wide market in the fabrication of hardenable steels which are susceptible to underbead cracking when conventional types of electrodes are used without preheat. Extensive field tests are stated to have disclosed that the Airco No. 394 will do a completely satisfactory job on this type of material. It is further stated that the Airco 394 will act as the high-tensile companion electrode to Airco No. 312 which is used on mild steel to produce a tensile strength in excess of 60,000 psi.

3
Road Maintainer

A road surface maintainer claimed to be of completely new design has been announced by the Maintenance Equipment Co., Providence, R.I. A flexible edged blade of independent, evenly spaced, spring tensioned teeth,

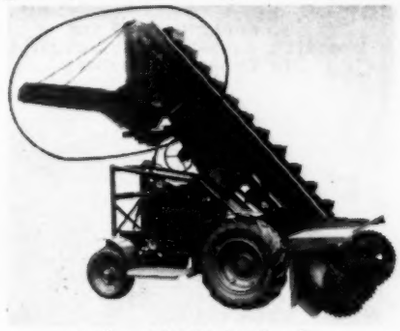


Meco Triple-Action Roadmaster

following all contours of the road surface is stated to insure thorough mixing of bitumen and cover material. The secondary mixing and rough shaping blade is also of spring tensioned sections and carries all surplus material to a windrow. A solid, widely adjustable, finishing blade picks up the surplus material windrow and shapes a smooth, even, long lasting surface. Although designed for blacktop, this maintainer has been found equally efficient for gravel surface maintenance. The machine is called the Meco triple-action roadmaster and is a speed-flow maintainer for all roads. It is fast, easy to operate and can be efficiently towed by tractor, truck or jeep.

4
Bucket Loader

A new bucket loader with a shorter base dimension to improve maneuverability, and with elevator and discharge mechanisms engineered for alongside truck loading and minimum headroom requirements has been announced by N. P. Nelson Iron Works, Inc., Clifton, N.J. Employing the Nelson principle of "picking before shoveling," the new model K5-B is equipped with renewable steel toothed feeder blades that loosen the material. Rated capacity of the loader is 2 yards per minute, handling earth, sand, gravel, cinders, coal, etc. A pivoted



Nelson K5-B Bucket Loader

discharge equipped with a belt conveyor loads trucks as they pass alongside. Angle of discharge is controlled from the operator's platform. Discharge conveyor can be locked in any position in its 180° arc of operation. Manufacturer points out that compactness (base: 11 ft. 11 in.; height: 12 ft. 8 in.) gives the loader definite operating advantages when working in crowded areas where short turning radius is essential and along road shoulders and similar places where low clearances prevail.

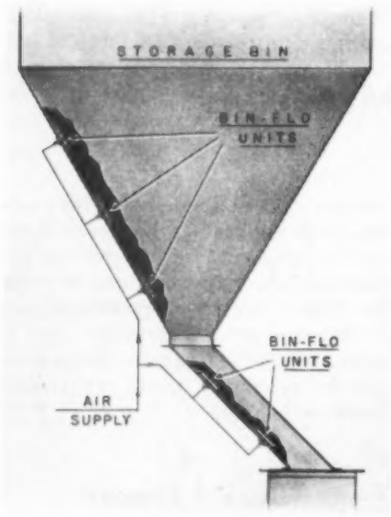
For More Facts on These Products

Mail inserted card, and we'll pass your inquiry along.

Or write directly to the manufacturers or their nearest distributors, referring to this issue of Roads and Streets and the equipment mentioned.

5
Aerating Device

A new aerating device designed to provide uniform and steady flow of bulk materials from bins, hoppers and chutes has been announced by Bin-Dicator Co., Detroit 15, Mich. The unit

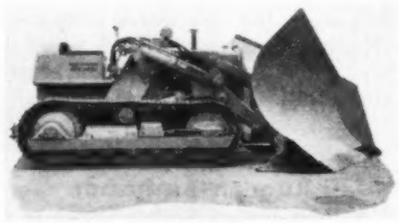


Bin-Flo Unit

is a small plate 3¾ in. x 7½ in. x ½ in. thick which is readily located at points where flow is restricted. Low-pressure air is injected into the material through a special fabric diffuser, causing the material to flow freely. It is claimed the units will not plug-up even with the most finely-ground material and are applicable to most dry, finely-ground materials. The device can be used in conjunction with Bin-Dicators or they can be installed independently. Models are provided for thin-walled bins and chutes and for concrete and other thick-walled hoppers. Piping can be run either outside of thin-walled bin or inside of thick-walled container. The company will be glad to make suggestions and specify type of unit and mounting to meet different needs.

6
Snow Plow and Snow Bucket

A new V-type hydraulically operated snowplow and a 2 cu. yd. snow bucket have been added to the list of



New Unit on HD-5 Tractor

allied pieces available to the HD-5 Crawler tractor of Allis-Chalmers Manufacturing Co., Tractor Division, Milwaukee, Wis. Both units will be sold exclusively by the Allis-Chalmers dealer organization. Both the plow and the 96 in. wide snow bucket manufactured by the Tractomotive Corporation, Deerfield, Ill., are interchangeable on the Tracto-Shovel assembly and require no extra equipment to effect efficient mounting. This job is simply accomplished by removing four pins from any one of the four Tracto-Shovel buckets which happens to be on the tractor, and then driving the HD-5 up to the unit to be mounted. No hoists or derricks are needed because the hydraulic arms of the Tracto-Shovel are automatically lifted in place. The entire operation requires only a few minutes. Dimensions of the plow are: width on the ground 116 in., width at the top 12 in., height of the V in front is 44 in. and height of the V in the rear, 66 in. The snow bucket is 96 in. wide and has a 2-yd. capacity.

7
Concrete Vibrator Shaft

A completely new vibrator shaft announced by Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill., manufacturers of Wyco concrete vibrators, is described as having the reinforcing spring of the flexible shaft completely "locked in" by solidly im-

FOR YEAR AROUND TRACTOR OPERATION
WITH
HORN-DRAULIC INDUSTRIAL LOADERS

MANUFACTURED BY THE WORLD'S LARGEST MANUFACTURERS OF HYDRAULIC LOADERS

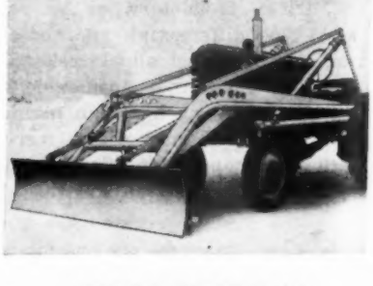
FORD

Streamlined and compact the Horn-Draulic Industrial Loader performs the year 'round leveling, filling and leveling job with ease. Let your small equipment do double duty.

CASE VAI

The twin cylinder operation lifts 1,690 pounds with ease. Easily installed and maintained. A sturdy, balanced unit of proven design.

A TWIN CYLINDER HYDRAULIC LOADER DESIGNED FOR SERVICE



JOHN DEERE M

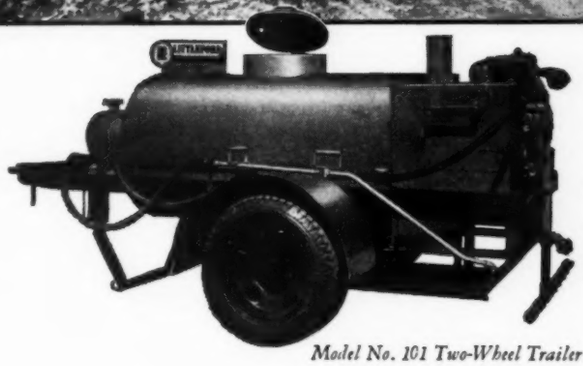
Engineered to distribute the load over the Loader frame. Tractor does not carry the strain. Check this labor saving, time saving loader today!

Write for complete specifications and engineering data on this outstanding Industrial Loader for your Ford, Case VAI and John Deere M Tractors. There is a representative in your locality.

WRITE FOR DETAILS

HORN MANUFACTURING COMPANY
INDUSTRIAL DIVISION 1000 NATIONAL BANK BLDG.
DAVENPORT, IOWA

PATCH THOSE BEAT UP ROADS WITH THIS LITTLEFORD *UTILITY UNIT*



Model No. 101 Two-Wheel Trailer

When it comes to Road, Street and Highway Repair there's no unit that gives as much Utility as the Littleford No. 101 Utility Spray Tank. Here's a piece of Road maintenance equipment that will do any type of patch work needed. It has a *Spray Bar* for small application jobs, *Hand Spray Attachment* for patch work and a *Pouring Pot Outlet* for small patch jobs, crack filling and joint filling. Let's get our Roads back into shape—use the Equipment that will do all the maintenance jobs at lower cost—the Model No. 101 Utility Spray Tank. Write for Bulletin No. 5 for further details.

Pouring Pot Outlet

Hand Spray Attachment

MANUFACTURERS OF

"Spray Master" Pressure Distributors

"Tankar" Steam Heaters	Highway Brooms	Asphalt Supply Tanks
"Kwik-Melter" Roofers Kettles	Tool Heaters	No. 101 Utility Spray Tanks
Trail-O-Rollers	Trail-O-Distributors	84-HD Asphalt Kettles

BLACK TOP ROAD MAINTENANCE EQUIPMENT — LB — SINCE - 1900

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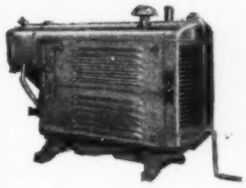
LITTLEFORD BROS., INC.

454 E. Pearl St., Cincinnati 2, Ohio

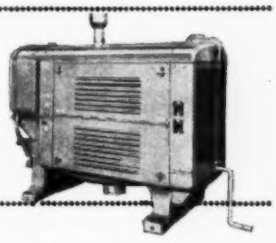
Look to MM *for* POWER, ECONOMY, AND EFFICIENCY

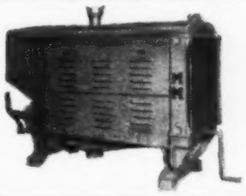
IN STATIONARY POWER AS WELL AS INDUSTRIAL TRACTORS



Model 165-4A 3⅝" x 4"—4 Cylinder 26 H.P. at 1500 RPM Burning Gasoline. 165 cu. in. displacement. Wt.: 1060 lbs. Model 206A-4A 3⅝" x 5"—4 Cyl. 38 H.P. at 1500 RPM Burning Gasoline. 206 cu. in. displacement. Wt.: 1080 lbs.

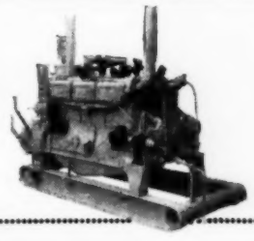
Model 283-4A 4¼" x 5"—4 Cylinder 52 H.P. at 1400 RPM Burning Gasoline. 283 cu. in. displacement. Wt.: 1850 lbs. Model 403-4A 4⅜" x 6"—4 Cylinder 64 H.P. at 1200 RPM Burning Gasoline. 403 cu. in. displacement. Wt.: 1950 lbs.

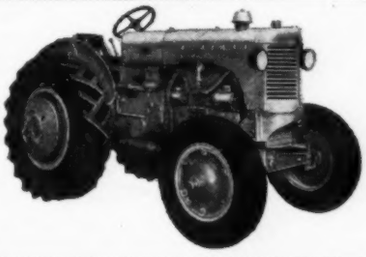




Model HUA 4⅜" x 6"—6 Cylinder 94 H.P. at 1200 RPM Burning Gasoline. 605 cu. in. displacement. Wt.: 3000 lbs.

Model 1210-12A 4⅜" x 6"—12 Cylinder 206 H.P. at 1400 RPM Burning Butane Gas. 1210 cu. in. displacement.





Model UTI Industrial Tractor 49 H.P. 126" Overall Length. 76" Overall Width. 16' Turning Radius.

Model RTI Industrial Tractor 27 H.P. 104" Overall Length. 59" Overall Width. 12' Turning Radius.

See Your Nearest MM Dealer—Distributor Or Write

MINNEAPOLIS-MOLINE

POWER IMPLEMENT COMPANY

MINNEAPOLIS 1, MINNESOTA

bedding it in a heavy layer of oil resistant moulded rubber. This imbedding of the spring provides a heavily reinforced shaft which is perfectly smooth on the outside. This new protection is claimed to prevent breakage of casing, insuring much longer shaft life than previous experience with vibrator shafts, and at the same time there are no external springs to catch on forms or reinforcing bars. These new Wyco vibrator shafts are further described as having another exclusive feature in the Wyco patented nonmetallic innerliner. This innerliner is impregnated with graphite, and there is stated to be virtually no loss of power thru friction. The core is protected at all times from contact with the inner metal tubing of the casing.

8

Off-Road Hauling Equipment

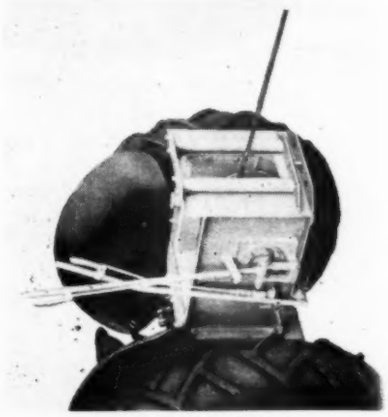
A new piece of hauling equipment, called the TH-4 Tournahauler, introduced by the Tournalayer Division of R. G. Le Tourneau, Inc., Longview, Tex., is a 45,000 G.V.W. vehicle designed to haul heavy length loads such as pipe, timber, steel, etc. This machine follows the LeTourneau tradition of incorporating operating characteristics designed not only to enable it to navigate the mire, sand and grades and sharp turns of off-road travel, but also to travel on the highways. LeTourneau features that make possible such versatility of movement are the Tournamatic torque proportioning differential, electric power steer permitting a full 90° turn of the Tournapull in relation to the rig, proper distribution of the load on both front and rear wheels, and the elimination of exposed springs and other vital assemblies under the frame that would drag when traveling through soft ground or become damaged by rocks or stumps.

Tournahauler Hauling 26,000 lb. Pipe Load Through Soft Ground

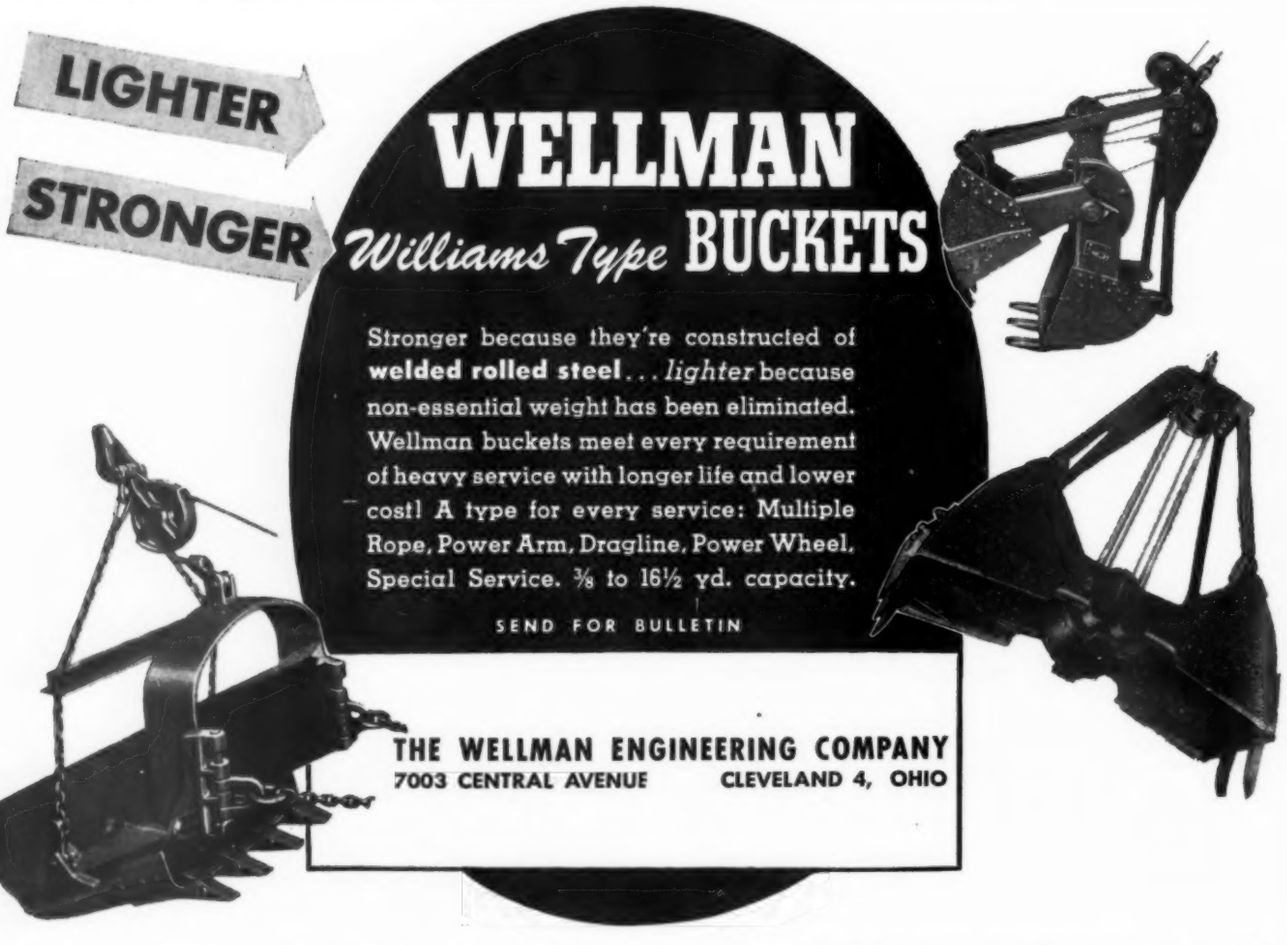
9

Tractor Winch

A new tractor winch announced by American Hoist & Derick Co., St. Paul, Minn., is a single drum unit with a maximum capacity of 7500 lb. single line pull on the first layer of cable. Adaptable to many industrial wheel type tractors, it can be easily installed for winch work or quickly removed when the P.T.O. shaft is required for other attachments. Among the outstanding features claimed for the American tractowinch are—fairlead rollers which allow a sharp off lead of the cable to either side, and permit easy moving of materials in tight spots, also a hand operated contracting band brake. A drawbar built into the winch frame allows the tractor to perform regular towing jobs without removing winch.



American Tractowinch


LIGHTER
STRONGER
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Williams Type BUCKETS
Stronger because they're constructed of welded rolled steel... lighter because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. 3/8 to 16½ yd. capacity.
SEND FOR BULLETIN
THE WELLMAN ENGINEERING COMPANY
7003 CENTRAL AVENUE CLEVELAND 4, OHIO

10
Portable Electric Hand Lamp

A new portable electric hand lamp with built-in charger, announced by U-C Lite Manufacturing Co., 1050 W. Hubbard St., Chicago 22, Ill., is stated to throw a powerful 2000 ft. beam. The principal features of this new Big Beam lamp include spillproof rechargeable battery with acidproof plastic case that does not leak whether the lamp is held upside down, sideways, or in any other position. With the usual storage battery attention,

Big Beam Model 312

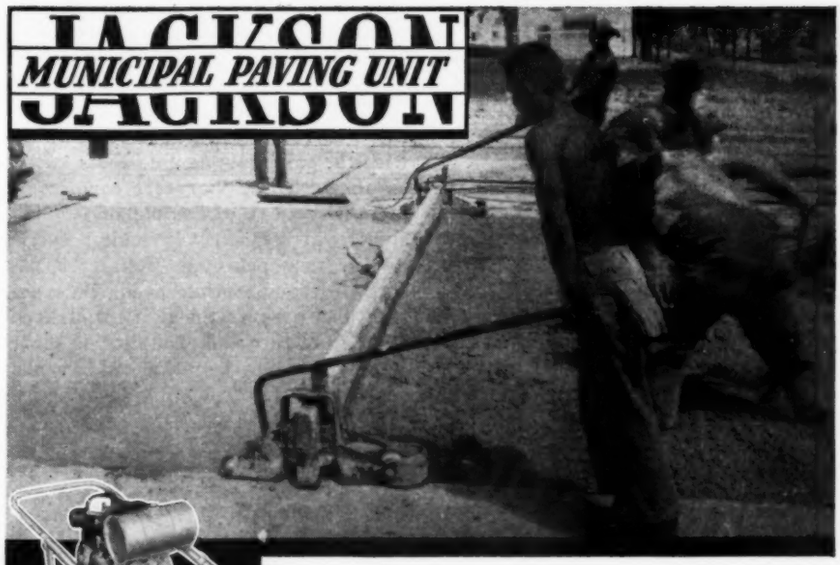
it is stated this battery will have a service life of from three to five years. Incorporated in the battery itself is a three-ball charge indicator that eliminates all guesswork on the condition of the battery and does away with hydrometer tests. A built-in charger that plugs into any 110-volt, A.C. circuit makes recharging the battery an easy and convenient matter.

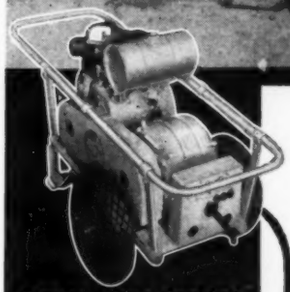
11
Diesel Engine

A new Cummins diesel engine, based on the well-known "Model H," yet developing 10 per cent more horsepower, has been placed in production by Cummins Engine Co., Inc., Columbus, Ind.

The new Cummins diesel, designated the HR-600 Engine develops 165 hp (maximum) at 1800 rpm, with 5⅛ in. bore and 6 in. stroke. Piston displacement is 743 cu. in. Like all Cummins Diesels, the HR-600 is four-stroke cycle and has the exclusive Cummins fuel system. The new HR-600 is available in an automotive model, HRB-600; three industrial models, HRBI-600, HRI-600, and HRP-600, and a marine model, HRM-600. Model HRBI-600 is the basic industrial model, Model HRI-600 is equipped with instrument panel and trunnion support base, and Model HRP-600 is an enclosed power unit with structural steel base, clutch power take-off, radiator, fan, engine hood and fuel tank. Field conversion to HR-600 from H-600 can be made by Cummins dealers. Steps involved include boring the

JACKSON
MUNICIPAL PAVING UNIT





Power plant furnished with unit: 1.25 KVA, generates both single and 3-phase 60 cycle AC. Also suitable for operating lights, vibrators, tools, etc.

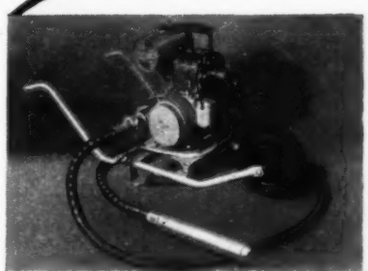
TAKE THE FIRST STEP towards handling those municipal paving jobs with greater dispatch and efficiency. Write for the complete facts, NOW.

Places perfectly
UPWARDS OF 65 Cu. Yds. of STIFF MIX concrete per hour

- Will undercut at the side forms; strike off to crown, both regular and inverted; roll back for second passes.
- Thoroughly vibrates concrete in slab depths up to 10" and is quickly adaptable to any slab width from 6' up to any practicable width.
- Works right up to and around sewers, manholes and other obstructions.
- Machine has strong tendency to propel itself in forward direction. Little effort required. Operators work from front, rear or sides.

THE IDEAL VIBRATOR
FOR EVERY TYPE OF CONCRETE CONSTRUCTION

See them at your Jackson Distributor (name on request) or tell us the nature of the job and we will send descriptive literature describing the vibrator that will handle the job to best advantage.



Model FS-6A. Flexible Shaft, Gas-engine drive. Available with 3 heads for thick or thin sections. Flexible shafting in 7' to 14' lengths up to 28', grinding and other attachments.

Model FS-7A. Flexible Shaft Electric. Ideal for decks, thin walls, and with short shafts for spud work.

Model HS-A4 Hydraulic — Gas Engine Driven. Highly reliable and efficient. Its 50 ft. reach saves many relocations.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

present block and installing HR-600 pistons and liners and the optional installation of the new increased-flow lubricating system and continuous groove bearings.

12
Concrete Vibrators

A line of concrete-vibrating equipment has been introduced by the Vibro-Plus Corp., 243 W. 55th St., New York 19, N.Y. It includes electrically-operated external vibrators, and internal vibrators which can be driven by gasoline, electric, or pneumatic power. The model RSB 55 has a 2 3/16 in. diameter, attains a frequency of over 15,000 vibrations per minute with the low flexible shaft speed of only 3600 revolutions per minute. The Model RSB 70 has a 2¾ in. diameter, and is rated at 10,500 vibrations per minute with the same low flexible shaft speed as above. These vibrators come complete with 20 ft. of flexible shaft. This step-up in frequency is made possible by the new patented "Rollgear" design of the vibrating head. This design also permits the lubrication free running of the head. The flexible shaft is lubricated in less than 20 seconds with no periodic stripping down necessary.

CONCRETE EVIDENCE:
Tougher, Smoother Roads Are Cured with
Fulco
Cotton Concrete-Curing Mats

Preferred and approved for State and Federal Highway construction, Fulco COTTON Concrete-Curing Mats assure uniform, 72-hour curing, with possibility of cracks reduced to a minimum.

Their greater insulation against sudden temperature changes, the ease with which they're kept dripping wet, their re-use on job after job, makes Fulco Cotton Mats the first choice of contractors whose reputations are built on CONCRETE evidence.

Uniform Curing Means Greater Compressive Strength!

Durably made of tough osnaburg, filled with cotton padding weighing 12 oz. to every sq. yard, stitched every four inches, with a 6" double osnaburg flap along the long side, FULCO MATS stay wetter longer with less water, assures the uniform curing that means uniform strength.

Write for specifications and price list. Address nearest factory branch.

FULTON BAG & COTTON MILLS

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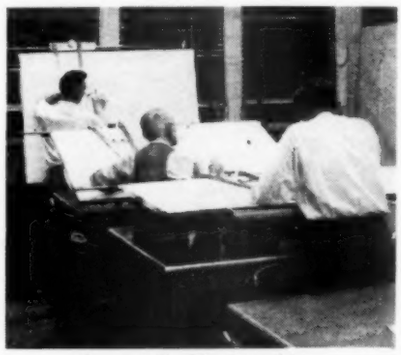
Denver · Atlanta · Minneapolis · New York

13
Steel Drafting Machine

A new stainless steel drafting machine, announced by Emmert Manufacturing Co., Waynesboro, Pa., is claimed to operate with perfect accuracy on any size or make drawing board without the addition of extra equipment or alteration of the drawing board. Through the machine's convenience of operation in any position from true horizontal to true vertical,



Emmert Drafting Machines

a comfortable working position is continuously maintained. Indexing of angles is simple, fast, and easy through the use of the micromatic quadrant, which allows indexing of every 3° by simply "flipping" the quadrant minute adjusting screw into desired degree setting and adjustments as fine as 2½ minutes by a slight turn of the minute adjusting screw. Emmert drafting machines are manufactured for boards 24", 30", 36", 42", 48", 54", 60", 72", 84", 96", 108", 120", and 132" by any length and special machines, including left handed machines, can be furnished for odd size drawing boards.

14
Traffic Paint

A new traffic paint based on two Hercules chemicals, Pentalyn 802A, a synthetic resin, and Parlon, chlorinated rubber, has proved to be outstanding in both durability and rapid dry, according to the manufacturers, Hercules Powder Co., Wilmington, Del. Test cross lines laid down on a highway intersection in South Camden, N.J., considered to be the second busiest highway intersection in the state, show little signs of wear after more than two months of service. Cross lines of a specified formulation in current use by the state, were laid down at the same time alongside the Pentalyn 802A-Parlon paint and were almost worn away at the end of the two months. The test lines were applied to both concrete and asphalt surfaces. Drying speeds of these new paints are stated to vary from 11 minutes to 20 minutes, depending on such factors as thickness of film and type of solvent.

15
Clay Spade

A new clay spade, designed for ease of handling and to reduce digging and upkeep costs, has been announced by Le Roi Co., Milwaukee, Wis. The tool weighs only 18 lb. and has a well-balanced 18 in. length An exclusive built-in oiling system is of primary importance to users. Oil from a large

Le Roi 31 Clay Spade

reservoir in the handle is metered into the live air stream and carried to every working part. This lubrication system, together with a special front-end sealing arrangement to exclude destructive dirt and foreign matter, are stated to increase operating efficiency and to extend tool life expectancy. As with all Le Roi air tools, drop forgings play an important part. Cylinder, handle, and steel retainer have been forged to form a tough armor-clad, hard-working tool. Spacer and chuck bushings are renewable.

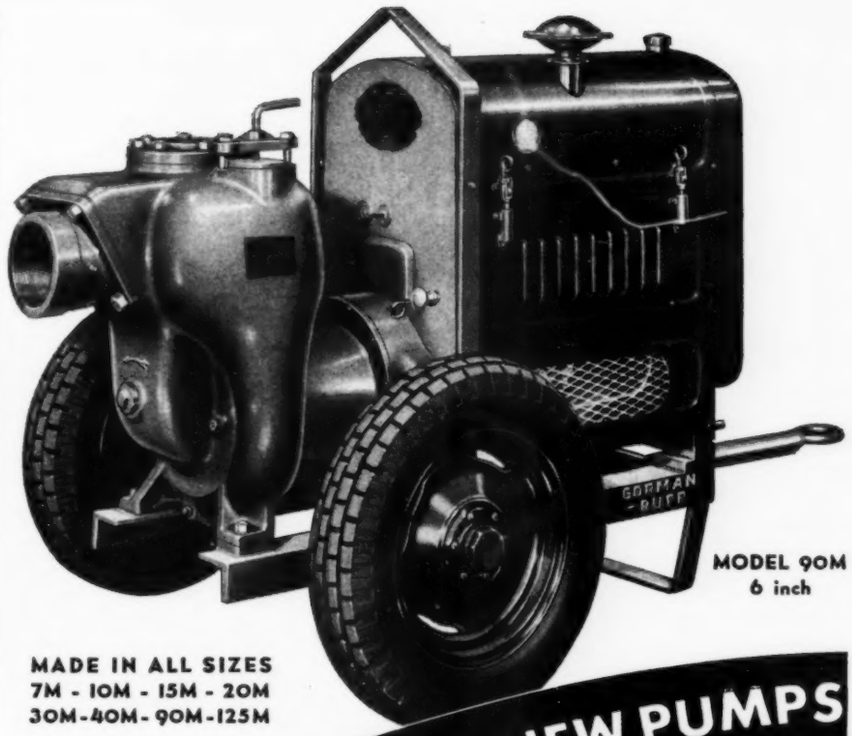
16
Air Cranking Motor

An air cranking motor designed to give quick, dependable, low cost starting of diesel and gasoline engines, has been added to the line of Leece-Neville Co., 5363 Hamilton Ave., Cleveland, O.

The starter features an air motor developed especially for the application by the Chicago Pneumatic Tool Co., coupled with time-tested and proven Leece-Neville starting equipment designs. It comes as a complete, ready-to-install unit, consisting of motor, reduction gear, drive, and drive housing. The compact, rotary motor occupies no more space than an electric starter, and can be installed with the same three bolts used for mounting the latter.

17
Welding Rods

Tube Tungsite and Tungrod, two new tungsten carbide welding rods for reclamation and hardfacing applications, have been announced by the American Manganese Steel Division of



MODEL 90M
6 inch

MADE IN ALL SIZES
7M - 10M - 15M - 20M
30M-40M- 90M-125M

GORMAN-RUPP'S NEW PUMPS

CHALLENGE ANY PUMP TO MATCH THEIR PERFORMANCE

With a new complete line of Contractors' Pumps, Gorman-Rupp has topped their own past high record of performance with a better pump --

-- QUICKEST PRIMING
-- HIGHEST PRIMING
-- PUMPS MORE DIRTY WATER

Compare them for priming speed:

The new Model 15M (3") primes at 25 ft. suction lift in 61 seconds.

The new Model 90M (6") primes at 25 ft. suction lift in 44 seconds.

And the Gorman-Rupp is still the most simple pump --

No ports, no valves, no clean-out plates, nothing to cause stoppages.

Write for the new Contractor's Bulletin 8-CP-11

THE GORMAN-RUPP *Guarantee*

Our distributors are authorized to put a Gorman-Rupp Contractors' Pump on any pumping job, anytime, anywhere, alongside any other make pump, size for size. The Gorman-Rupp pump is guaranteed to pump more dirty water more hours, using less gasoline and to prime quicker than any other self-priming pump. If it isn't the best all around pump, our distributor will accept the return of the Gorman-Rupp pump and pay the user any installation expense incurred.

THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

the American Brake Shoe Co., 230 Park Ave., New York 17, N.Y. Amsco Tube Tungsite is recommended by the manufacturer for applications where severe abrasion occurs and where highly efficient cutting qualities are needed. It is stated to be an excellent hardfacing for rotary drill bits, power shovel teeth, ditcher teeth, dredge cutters, pug mill knives, scraper blades, scarifier teeth, as well as many other items.

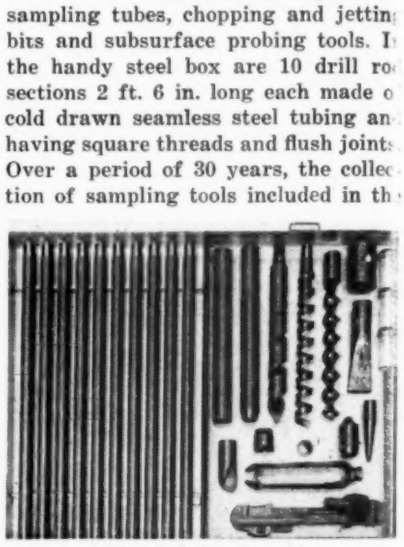
Coated Tungrod applied by the electric arc process is recommended by the manufacturer for use on scarifier teeth, power shovel teeth, grader blades, screw conveyors, etc.

18
Steel Shoring Device

A new type steel adjustable shoring device, stated to be capable of supporting, with perfect safety, considerably more than the collapsible weight of the hand-made timber shore, has been introduced by Acrow, Inc., Newark, N.J. In addition to its use in supporting temporary formwork to concrete floor arches, beams, walls, columns, etc., it is adaptable to scaffolding and sway bracing. The shore is made in four heights ranging from 5 ft. 7 in. to 11 ft. and is adjustable up to 15 ft. when fully extended. Operation of the shore is effected by one person. Since no jacks and bars are required, a workman can stand upright and in three simple movements can accurately erect it to any working range in a matter of a few seconds. This consists of lifting an inner tube, inserting a pin in the nearest hole which acts as a safety lock, and turning the handle for final adjustment.

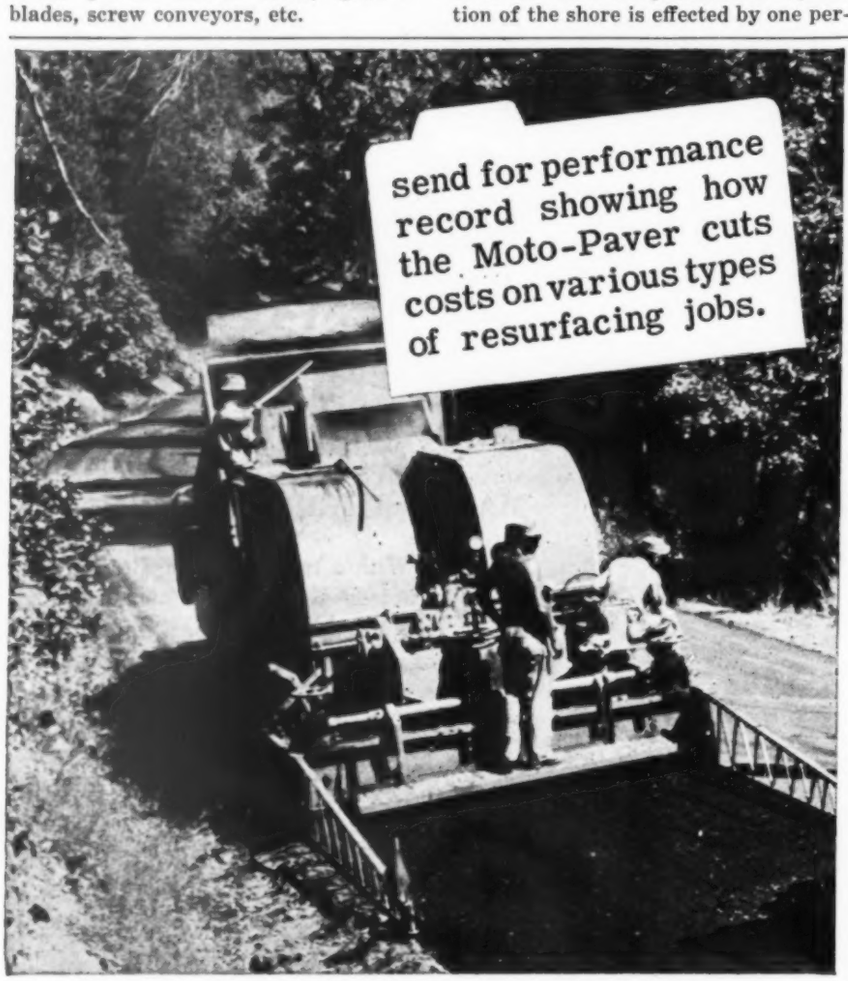
19
Soil Sampling Kit

A soil sampling kit for manual operation, added by Acker Drill Co., Inc., Scranton, Pa., to its line of power core drills and test boring machines, consists of 12 different earth augers, soil sampling tubes, chopping and jetting bits and subsurface probing tools. In the handy steel box are 10 drill rod sections 2 ft. 6 in. long each made of cold drawn seamless steel tubing and having square threads and flush joints. Over a period of 30 years, the collection of sampling tools included in the



Acker Soil Sampling Kit

Acker kit has been found to cover almost all conditions likely to be encountered in subsurface investigations. These earth and soil samplers are widely used to determine subgrade conditions for highways, airfield runways, sewer lines and soil stabilization projects. For proving foundations and searching clay and brick-making deposits, they have, for many years, proven dependable. To withstand hard driving by sledge or heavy mall, the steel tubing drill rods have a heavy shoulder. Cutting shoes are of hardened, heat-treated steel. The complete kit can be conveniently placed in any automobile.



This report, giving typical cost figures, will be sent on request.

Contractors who bought the first year's output of Moto-Pavers did so largely on our recommendation, backed by our 80 years' experience in building asphalt mixing equipment. Today you can buy a Moto-Paver on its own performance record—on various types of work—in more than a dozen states. Types of work handled have included sand asphalt, retread, bituminous resurfacing over gravel and old pavement, bituminous stabilization and oil mix on city streets, county roads and state highways, using various types of aggregates and bituminous materials.

Costs varied widely, due to material, weather, traffic and other road conditions. However, a typical cost table shows surprisingly low total mixing and laying costs per ton. Send for report which gives these detailed cost figures on various types of jobs.

HETHERINGTON & BERNER, INC.

721 Kentucky Ave., Indianapolis 7, Ind.

MANUFACTURERS' LITERATURE

20
Diesel Powered Equipment

"Turning Blueprints into Highways," a recent publication of Caterpillar Tractor Co., Peoria, Ill., contains 16 pages of illustrations showing diesel powered equipment operating

in all phases of road construction throughout the world. Thirty-four different pieces of diesel powered equipment are shown working in every phase of highway construction. Industrial engines, electric sets, rubber-tired earthmoving equipment and track-type tractors are shown working on actual jobs throughout the world.

21
Diesel Engines

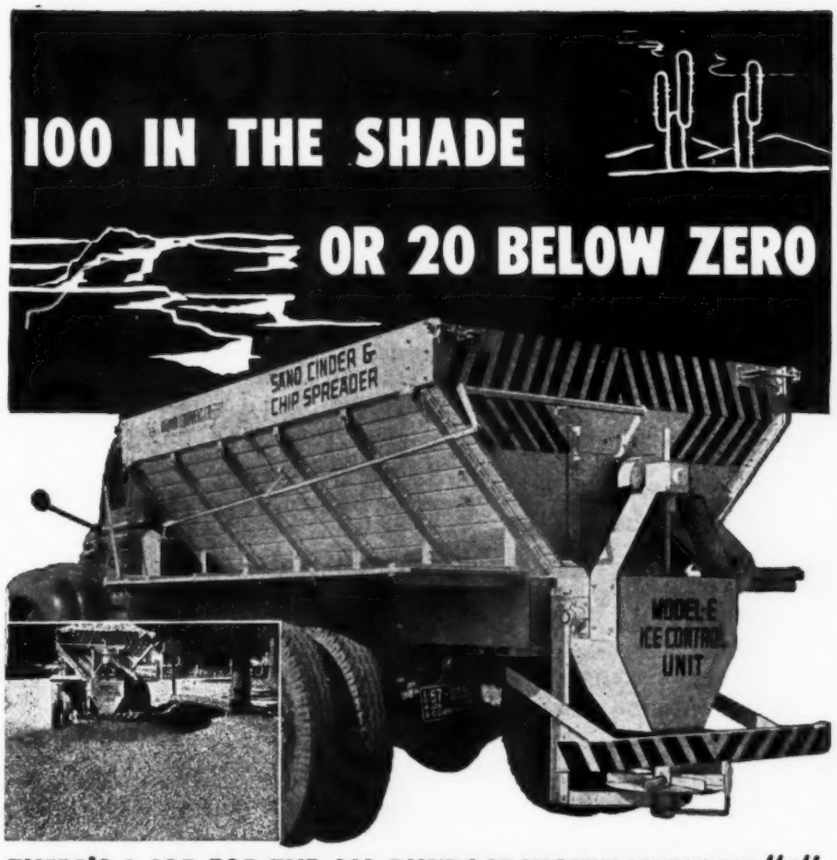
Three new bulletins, released by Cummins Engine Co., Inc., Columbus, Ind., describe the design, performance and facilities for servicing Cummins diesel engines. "The Exclusive Cummins Fuel System" is a non-technical description of the system of fuel delivery and injection used in Cummins diesel engines. "On-the-job Performance" describes the application of Cummins diesels to trucks, shovels, earthmovers and other equipment used in the construction and material handling industries. This bulletin contains numerous photographs and job histories of Cummins-powered equipment operated by leading contractors throughout the United States. "Dependable Service for Dependable Diesels" is a large wall map showing the location of Cummins sales, service and parts facilities throughout the world.

22
Airport Pavements

The new "Design Manual for Airport Pavements" (AP-10) prepared by the Wire Reinforcement Institute, Inc., Technical Service Division, 1049 National Press Building, Washington 4, D.C., contains the latest data on the use of welded wire fabric reinforcement in airport pavement design. This manual, prepared under the technical supervision of Theodore J. Kauer, managing director, is a practical, up-to-the-minute handbook (32 pages) for the engineer in the design of airport landing facilities conforming to CAA requirements for projects planned under the Federal-Aid Airport Act, for drainage systems, sub-bases, and reinforced concrete pavements for runways, taxiways and aprons. The material is presented in concise, logical form supported by charts, tables, graphs and formulae to aid the airport designer and engineer.

23
Portable Material Elevator

In a new 8-page catalog covering its portable material handling elevator, American Hoist and Derrick Co., St. Paul, Minn., announces a new allowable height of 97 ft., with a platform lift of 90 ft. The elevator is self-erecting when used at the 47 ft. height



THERE'S A JOB FOR THE ALL-PURPOSE HIGHWAY MODEL "E"

● Spreading sand and cinders for ice control on streets, highways airport runways, etc. ● Spreading calcium chloride for dust control on secondary roads, parking lots, airports, fair grounds, etc. ● For seal coat work, spreading chips, sand, etc., over newly laid oil or blacktop ● Patch work spreading ● Spreading commercial fertilizers in parks, on lawns ● Hauling crushed rock and chips ● General road and shoulder maintenance

14 OUTSTANDING FEATURES THAT SAVE TIME, MATERIAL AND MONEY

1. Uniform spread at all speeds.
2. Covers 2 or 4 lane highway in one operation.
3. Spreads material on highway where needed. No material wasted on shoulders.
4. Operates forward or reverse.
5. Spreads to right, to left, or both sides as desired.
6. Material is cast low to ground—no interference with traffic.
7. Spread may be started or stopped with truck in motion.
8. All controls within easy reach of driver's seat—one-man operation.
9. Material is also spread ahead of rear wheels of truck assuring traction and safety at all operating speeds.
10. Electrically welded all steel frame.
11. Wooden hopper eliminates corrosion from chlorides, assures longer life; also wet material won't freeze to sides in cold weather as is often the case with a steel hopper.
12. Ball bearing gear boxes, oil tight, dust and water proof.
13. Self-unloading 24" wide conveyor assures steady material flow.
14. Hopper sides hinged for easier hand loading.

The Highway Model "E" Spreader is made in 9, 11, 13 and 15 ft. lengths—easily mounted on any standard truck chassis. Other lengths made on special order. Write for literature—today.

HIGHWAY EQUIPMENT COMPANY, INC.
605 D AVENUE N. W. • CEDAR RAPIDS, IOWA

MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

or under. A concrete bucket of 14 cu. ft. capacity is available which is interchangeable with the 6 ft. x 6 ft. platform, both units being pin connected for quick, easy installation. The new catalog contains many operating views as well as mechanical details.

24
Tractor

Features of its diesel D6 track-type tractor are outlined in a two-color, 32 page booklet released by Caterpillar Tractor Co., Peoria, Ill. This publication presents the specifications of the tractor along with manufacturing and engineering features. Highlighted are typical jobs that are handled by the tractor.

25
Portable Batching Plants

Solving the road builder's batching problem with greater flexibility and efficiency is the subject of the new and colorful 24-page catalog, "Roadbuilders Portable Batching Plants," published by The C. S. Johnson Co., of Champaign, Ill. Using more than 65 actual photographs, schematic drawings and specification charts, the booklet presents numerous cost-cutting ideas for aggregate and cement handling arrangements that have a practical application in many specific problems. In addition to setting forth the general requirements for a typical roadbuilder's plant, the booklet lists a complete discussion of various cement and aggregate-batching methods and equipment. Typical plant layouts are depicted in color sketches to illustrate time and labor-saving features. Also included in the new booklet are complete descriptions and photographs of four new pieces of batching equipment recently developed by The Johnson Co.

26
Huber Co. Booklet

A 16-page illustrated booklet, "The Huber Story," has been published by The Huber Manufacturing Co. of Marion, O., in observance of the company's 85th anniversary year. Designed to present the company's history informally, the reader also is taken on a tour of the company's 19-acre site and given on-the-job pictures throughou the plant.

27
New Euclid Film

"Euclids Move the Earth," the new full 16-mm. sound film covering Euclid's complete line of off-the-highway earth moving equipment has been released by The Euclid Road Machinery Company, 1361 Chardon Road, Cleveland 17, O. Filmed by Euclid cameramen, it is a pictorial, on-the-job movie of the various applications of earth moving equipment in metallic and nonmetallic strip mines . . . highway and railroad projects . . . airports . . . dams . . . levees . . . and other large construction programs. This 30 minute presentation, which was previewed at the recent ARBA Road Show in Chicago, is now available for booking. Interested parties should direct their requests to Euclid representatives or distributors or directly to the sales development department of the home office.

28
Construction Pumps

Seventeen different series of self-priming centrifugal pumps and three series of diaphragm pumps especially designed for use in construction work are described in a new 12-page, 2-color bulletin released by Marlow Pumps, Ridgewood, N.J. The bulletin contains performance tables stating the capacities in gallons per minute at heads from 15 to 110 ft., for the low-pressure (at AGC Rating) and 40 to 280 ft., for the high-pressure self-priming centrifugals. Detailed pictures of the pumps in each series are included. The sizes range from 1½ to 10 in. for the low-pressure group and 1½ to 4 in. for the high-pressure group of self-priming centrifugals. Capacities are from 50 to 4,000 gal. per minute and 5 to 500 gal. per minute for these two groups, respectively.

You'll be "Loads Ahead" with "On the Job" design

Bigger payloads? They're built right into every Marion unit by engineers who are experienced in meeting the profit problems of every kind of a hauling job. *Better performance?* There's a Marion body or hoist developed under actual "on the job" work conditions to stand up better under your toughest hauling job.

Get the facts from your nearest Marion Distributor or write direct.

Marion Bodies Illustrated: Tandem tractor unit and four wheel trailer unit mounted on Model HD-10 hoists.

MARION
DUMP BODIES and HYDRAULIC HOISTS

MARION METAL PRODUCTS CO.
MARION, OHIO

29
Timber Service Bulletin

For the benefit of young architects, engineers and other young men, who have come into industry since the war, the Timber Engineering Co., Washington, D.C., has prepared a brochure entitled "For Users of Wood and Forest Products." Outlining the technical services available to them, the bulletin covers not only timber engineering and designing but also timber and forest products research, product development and wood chemistry.

30
Morse-Formsprag Clutch

A new 16-page catalog devoted to the new Morse-Formsprag full complement over-running clutch, its construction, development and working principle, has been issued by Morse Chain Co., Detroit 8, Mich. The catalog gives engineering diagrams of special design at work with the Morse-Formsprag clutch integrated within the designs.

31
Tractor Equipment

A new "Hyster Reference Book" issued by Hyster Co., Portland, Ore., in its 72 pages of photographs, diagrams and technical data, lists and explains Hyster's line of tractor equipment. The 29 tractor products manufactured by the Hyster Co., are grouped under such major headings as: The towing winch, The Logging Arch and Sulky, The Tractor Yarder and Donkey, The Hystaway, The Worm Drive Winch, The Tractor Crane, and The Utility Winch. In addition to the Hyster data, much general information on the use of tractor equipment is given. Valuable charts, formulas and terminology in such form as to be handy for speedy reference are also included.

32
Treated Lumber

Service records on installations of "Wolmanized" treated wood have been brought up to date and its contents summarized in a new report by the technical department of the American Lumber & Treating Co., Chicago, Ill. Detailed files on such varied classes of installation as wet-process factories, railroad structures, bridges, mines, refrigerated buildings, water works and stadiums show that less than one-half of one per cent of all the lumber covered by the records has failed because of decay or insect attack. Over 10,000,000 board feet of the 34,000,000-foot total is between 20 and 25 years old.

33
Hard-Facing Alloys

A hardfacing booklet, covering the complete new line of Airco hardfacing alloys, has been published by the Air Reduction Sales Co., New York, N.Y. The sixteen page two-color, profusely illustrated booklet, which also serves as a hardfacing catalog, describes each of Airco's new alloys in complete detail. Included are data on typical uses, specifications, application technique, deposit hardness, color markings and deposit analysis. Every page is full of helpful, authentic information on how to combat wear and increase equipment work-life.

34
New Adams Film

A new, 16 mm. full-color, sound moving picture, "Adams All-Purpose Motor Graders," has recently been completed by J. D. Adams Manufacturing Co., Indianapolis, Ind. The movie shows Adams motor graders at work on a wide variety of road construction, road maintenance, and miscellaneous grading jobs. It also shows the new Adams rotary snow plow at work on an Adams motor grader as well as "V"-type plow and wing snow removal work. The film can be seen by contacting any Adams distributor.

Save Money with YAUN

Yes, YAUN saves you money. Every bucket is engineered to give years of faithful, profitable service. All welded construction, perfect balance and the satisfaction of thousands of users are your guarantee that YAUN does the job right. If you haven't become familiar with YAUN'S buckets, ask your dealer.

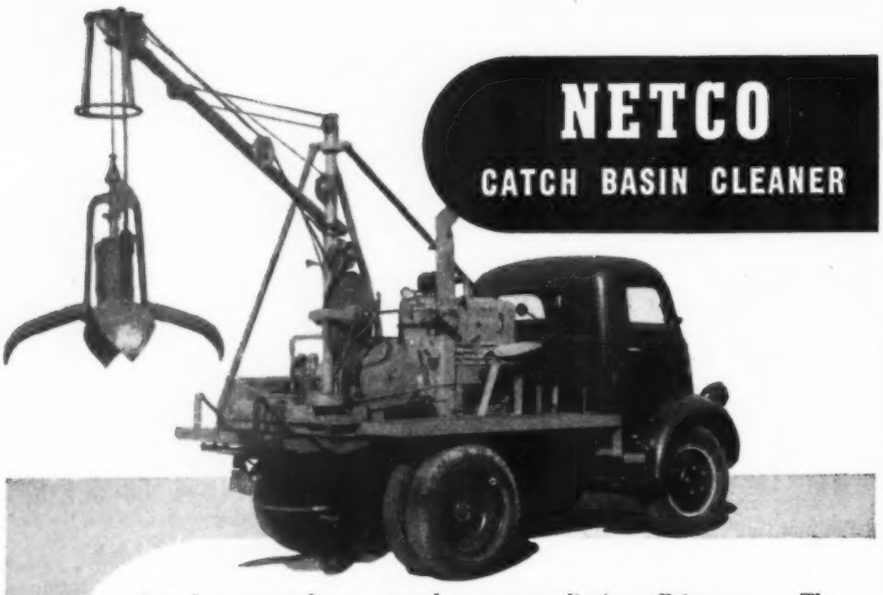
Perforated Model

Basket Type

Shell Type

YAUN DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

Write for folder



NETCO
CATCH BASIN CLEANER

Can be mounted on any short wheel-base truck having at least 8 ft. in back of cab. You can purchase unit separately and mount on your own chassis . . . The Netco Unit can be removed from truck in 30 minutes, permitting use of truck for other purposes. The Netco Bucket closes pneumatically assuring positive and maximum digging efficiency . . . The Bucket has full 1½ cu. ft. capacity with no chains or linkage to obstruct operation.

The Netco Catch Basin Cleaner is faster, safer and more economical to operate than any other method used to remove debris from catch basins.

Send for illustrated folder.

NETCO DIVISION CLARK-WILCOX COMPANY

118 Western Avenue, Boston 34, Mass.

A TRADE-MARK OF
Special Significance
TO YOU

MOST H.P.HOURS
WISCONSIN
HEAVY-DUTY
~~Air-Cooled~~ ENGINES

The recently adopted trade-mark reproduced above, an attractive decal of which is placed on every Wisconsin Engine that leaves our plant, should be of particular interest to you . . . as a manufacturer, designer, or user of engine-powered equipment.

"Most H. P. Hours," as applied to Wisconsin Air-Cooled Engines, is today establishing a new measure of engine value. Its significance lies in the fact that it accurately expresses the thing you pay for and in which you are most interested — *maximum horsepower hours of dependable, on-the-job service.*

It's a point well worth remembering, and acting upon.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 14, WISCONSIN

35
Batching Equipment

Distribution of six attractive new bulletins, describing its complete line of batching equipment has been announced by The Heltzel Steel Form and Iron Co., Warren, O. The batchers described range from the 1¼ cu. yard aggregate type to a 6 cu. yd. combination cement-and-aggregate unit. The batchers are used with Heltzel bins rated from 30 tons to 400 tons aggregate capacity and from 100 barrels to 1500 barrels cement capacity. The batchers are used for truck mixer and batch truck operations and in the central mix and concrete products industries. The new bulletins are: Heltzel Dustless Cement Batcher (Bulletin J-38); Heltzel Dual Cement Batcher (Bulletin J-40); Heltzel Combination Batcher (Bulletin J-42); Heltzel Dual Aggregate Batcher (Bulletin J-44); Heltzel Truck Mixer Batcher (Bulletin J-46); Heltzel Universal Batcher (Bulletin J-48).

36
Hard-Facing Alloys

Two new hard-facing alloys, announced by Stoody Co., Whittier, Calif., were especially engineered for added wear protection on heavy equipment. These are Stoody Self-Hardening 21 for applications involving extreme abrasion with moderate impact, and Stoody 1027 for severe impact with moderate abrasion. They are recommended by the manufacturer for such equipment as tractor parts, power shovels, crushers, impellers, mechanical loader lips, etc. It is claimed that with the variation in characteristics obtained with the new Stoody Self-Hardening 21 and Stoody 1027, problems involving severe impact or abrasion can be specifically treated, with considerable advantage in increased life and lower maintenance. Both alloys are in the low-cost group and each has been carefully field-tested for over a year.

37
Wire Rope

A booklet recently released by the Preformed Wire Rope Information Bureau, Chicago, Ill., presents wire rope in a novel and interesting manner. It is a 16-page picture story entitled "The Wonders of Wire Rope." In something of a "comic book" style it tells about the travels of a power shovel operator and his family. They see the many uses of wire rope from deep in the earth to high in the sky, see how wire rope is made, and hear the story of Preformed wire rope. This booklet tells the story of an important

industrial product. It is educational and interesting, especially for men who are busy as well as for operators of equipment who do not ordinarily see literature of this kind.

38
Cleaning Construction Equipment

How clean-up routines are being simplified, equipment downtime reduced, costs lowered and many man-hours saved through the use of steam-detergent cleaning methods, is discussed in a special feature article appearing in a recent issue of Oakite News Service, house publication of Oakite Products, Inc., New York. The article defines steam-detergent cleaning as the simultaneous application of heat, steam pressure and detergent solution. Also emphasized is the ease with which the steam-detergent method may be set up. In addition to listing the applications of the steam-detergent method in removing various types of soils the article also provides interesting illustrations of actual steam gun equipment cleaning paint-stripping operations.

39
Power Tools

The entire line of Syntron power tools is illustrated and described in a new catalog of Syntron Co., Homer City, Pa. The line includes portable electric hammers, 100% self-contained gasoline hammer paving breakers, external concrete form vibrators, internal flexible shaft concrete vibrators, and a complete range of sizes of portable electric drills, grinders, sanders and their accessories.

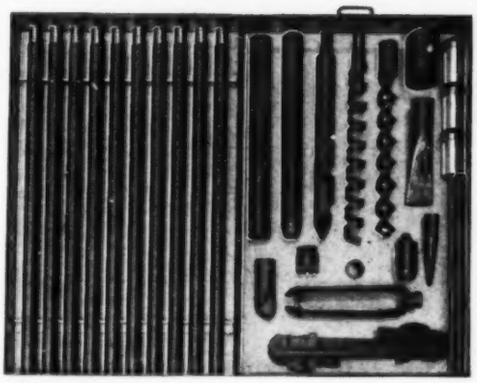
40
Arc Welding Electrodes

A new, 40-page, electrode catalog has been announced by the Wilson Welder and Metals Co., Inc., 60 E. 42nd St., New York 17, N. Y. The new catalog contains 50 photographs and diagrams, an electrode selector chart and complete details on all the electrodes in the extensive Wilson line. Typical data supplied are general description, application, welding procedure, mechanical properties, and specifications.

41
Bulldozer Applications

Numerous applications of the bulldozer are shown in a booklet released by Caterpillar Tractor Co., Peoria, Ill. A few of the applications illustrated are grading hillside grain land to permit more effective contour farming, heavy digging on stripping operations,

SOIL SAMPLING KIT



TWELVE SOIL AND EARTH SAMPLING TOOLS IN HANDY STEEL BOX

•

CAN BE CARRIED IN ANY AUTOMOBILE

•

ACCURATE SAMPLES OF EARTH AND SOIL MATERIALS

Thirty years' experience has proved these tools will recover accurate samples from practically all earth materials.

MANY USES include aluminum silicate deposits—brick and clay materials—foundation test borings—gold bearing sands—kaolin and clay for ceramics—sand and gravel pits—subgrade testing for highways and airfield runways—base materials.

Send for Literature

ACKER DRILL CO., Inc.
SCRANTON 3 · PA.

KINNEY
BITUMINOUS DISTRIBUTORS

EASY CONTROLS FOR SPEEDY APPLICATION

The Kinney Distributor provides complete control right at the operator's fingertips. A large handwheel gives full and accurate sidewise control of the spray bar . . . eliminates overlap of strips . . . permits faster truck speeds. One simple, three-way valve controls the entire operation of the Kinney Distributor—from loading to circulating to the actual spraying. This single valve, either manually or air operated, is the simplest control on the market; it's speedy, leakless, efficient. The Kinney Distributor handles all grades of bitumen used in road work: tar, asphalt, road oil, cut back, and emulsions. Its Jacketed Rotating Plunger Pump works with meter-like accuracy and finishes each job exactly to specifications.

Write for new Bulletin A-48.

All controls right at operator's fingertips

KINNEY MANUFACTURING CO.
3537 WASHINGTON STREET
BOSTON 30, MASS.

New York • Chicago • Philadelphia
Los Angeles • San Francisco

We also manufacture Vacuum Pumps, Liquid Pumps and Clutches

OWEN BUCKETS *are popular for* LOW HEADROOM

and thus are more adaptable to various operating conditions.

Owen Bucket heads are one-piece alloy steel castings, light enough to prevent top heaviness and designed for rigid arm connections.

Special head design eliminates wear on upper arm ends. Rack and wobble is prevented.

A MOUTHFUL AT EVERY BITE

The Owen Bucket Company
6070 Breakwater Avenue, Cleveland, Ohio
Branches: New York • Philadelphia • Chicago • Berkeley, Cal.

conversion from underground to open pit operations, backfilling drainage ditches and land clearing and leveling. Other features are the use of the "Caterpillar" bulldozer with a Hystaway for stripping of overburden; use of the Fleco stumper for land clearing and the Fleco root rake for digging roots and piling brush.

42
Joint Sealing Compound

A new 6-page folder on "Flintseal" hot poured joint sealing compound for concrete pavements has been issued by the Industrial Products Division, The Flintkote Co., 30 Rockefeller Plaza, New York, N. Y. The folder in addition to giving a description of this thermoplastic rubber asphalt sealer shows examples of equipment being used for its application.

43
Cleaner for Lighting Globes

The Skybryte Co., Cleveland, O., has issued an informative folder on Skybryte cleaning crystals for cleaning street lighting globes, glass, reflectors, porcelain skylights and factory windows. Crystals dissolve readily and solution is made when, where and in quantity needed. Folder mentions prices and offers sample upon request.

44
Portable Elevators—Air Compressors

Two new bulletins have been released by O.K. Clutch & Machinery Co., Columbia, Pa. One deals with the easily and quickly erected OK portable elevators. Illustrations of the erection methods, together with specifications are included. The other bulletin covers the OK MTD compressor, which was designed particularly for use by cities, water companies, public utilities and spray painters. This 60 cu. ft. compressor is made for trailer mount, or it can be obtained with skid mount that can be set in the body of any ordinary pick-up truck. Illustrations, description and specifications are given.

45
Lubricator Valve

The Grannan lubricator valve for single line centralized lubrication systems is fully illustrated and described in an 8-page booklet published by Titeflex, Inc., 737 Frelinghuysen Ave., Newark 5, N.J. Data for selection and installation have been included. The operation of the Grannan lubricator is clearly explained by means of cross-sectional drawings.

46
Excavator

A new catalog published by The Byers Machine Co., Ravenna, O., thoroughly describes and gives up-to-date specifications and technical data and illustrates possible job applications of its Model "83", ¾-yd. excavator. The catalog explains in detail, with both photographs and line drawings, all the various features together with operating data of the Model "83." The last section photographically depicts several job applications for which this excavator may be used.

WITH THE MANUFACTURERS

(*Continued from page* 97)

Dealer Honored by FWD

Having recently completed its twenty-fifth year of business, the Liberty Trucks & Parts Co., Denver, Colo., was presented with a plaque honoring that company on the silver anniversary of its dealership with the Four Wheel Drive Auto Co., Clintonville, Wis. The Liberty Truck & Parts Co.'s association with FWD came about through purchase and sale of surplus military World War I FWD trucks. R. H. Schmidt, then service manager and now vice-president in charge of

Built for ACTION

- RUGGED
- DEPENDABLE
- VERSATILE
- ECONOMICAL

THERE IS A LA CROSSE TRAILER TO FIT EVERY JOB. 11 TO 200 TONS

HEAVY DUTY LA CROSSE TRAILER CORPORATION

W. A. Olen, President Four Wheel Drive Auto Co. Presents Plaque to R. F. Carlson

sales for FWD, met Dick Carlson, co-founder of Liberty and now its president, at a surplus truck sale in New Mexico in 1923. Shortly afterward a sales and service contract was signed between Liberty and FWD.

New Haiss Representative

John F. Day, 1060 Kenmore Ave., Buffalo, N.Y., has been appointed exclusive sales representative for the northwestern sections of New York and Pennsylvania for the George Haiss Manufacturing Co., Inc.—division of Pettibone Mulliken Corp.,

J. F. Day

J. Benater

New York City and Chicago. J. Benater, 232 E. 86th St., Brooklyn, N.Y., has been appointed sales representative in the 5 boroughs of New York City. Both men have had wide experience in the sales, application and servicing of material handling equipment, and will handle the completely new and redesigned line of Haiss conveyors, car unloaders and loaders.

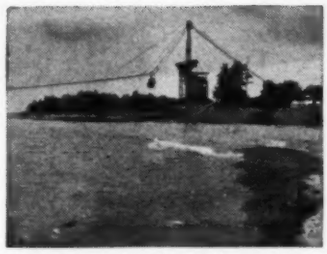
Osgood Appointments

Fred L. White, heretofore chief engineer, has been appointed development and consulting engineer of The Osgood Co., Marion, O. In his new capacity, he will divide his full time between the home office and the field. Mr. White joined The Osgood Co. in 1917 as engineer and draftsman, and was appointed Chief Engineer in 1937. Appointed to succeed Mr. White as chief engineer is John E. Callouette. Mr. Callouette has served as design engineer of Clark

Save Power and Labor On Your Long Haul Digging

SAUERMAN

CABLEWAYS and SCRAPERS



This Sauerman Slackline Cableway digs gravel from lake and keeps screening plant supplied with 75 tons an hour.

Sauerman Scraper moves material from wide pit to crusher.

Your next material handling job will move faster and smoother, and pay off in real savings if you use the Sauerman method. With one of these Sauerman machines you can reach out across a wide area, digging, hauling and dumping automatically in one economical operation. Requires only one man at the controls and power consumption is remarkably small, whether electric, gasoline or Diesel. Installation cost is low and maintenance simple.

Let us recommend the right type of machine for your class of work. Send for our illustrated Catalog and tell us about your own problems.

SAUERMAN BROS., Inc.
588 So. Clinton St. Chicago 7, Ill.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

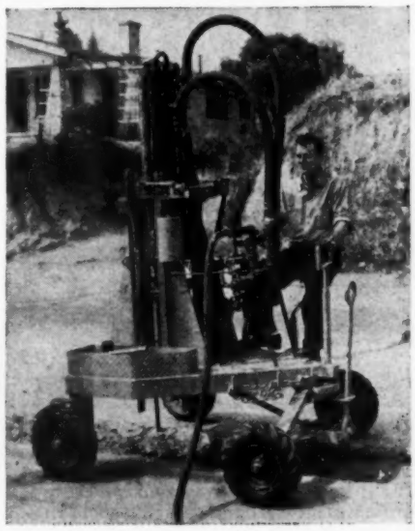
FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO.

BREAK PAVEMENT the low cost way!

By Using
THE MIGHTY MIDGET



No fatiguing labor. The operator rides and breaks concrete and asphaltic pavement. Tamps trench backfill. Does over five times as much work using only a 105 CFM compressor. Write for a bulletin and nearest dealer's name. (MM-3)

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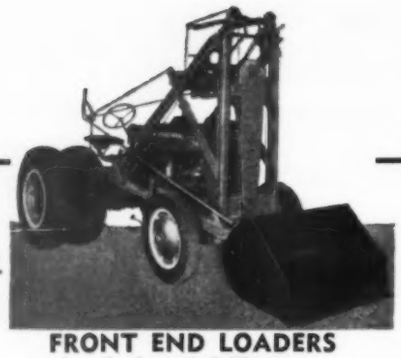

1/2 Cu. Yd. 8' Lift

FRONT END LOADERS
for Industrial Tractors
Write for Catalog

Elkhart White Mfg. Co. Indiana

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Brothers Corp., Olean, N.Y., manufacturers of compressors and engines for use in the oil fields, and as chief power engineer for the Industrial Rayon Corporation of Painesville, O.

Thew Promotions

M. B. Garber, heretofore assistant sales manager and export manager of The Thew Shovel Co., Lorain, O., since 1937, has been appointed general sales manager. He succeeds the late Don G. Savage, who died on July 25th. Garber immediately announced the appointment of Q. J. Winsor and J. T. Cushing as assistant general sales managers.

Q. J. Winsor

J. T. Cushing

M. B. Garber

Winsor previously held the position of assistant to the general sales manager and district sales manager for the East-Central territory, while Cushing has been district sales manager for the West Coast, located in San Francisco. Mr. Garber became a member of the Thew Sales Department in 1927, serving as sales office manager and later covering territories in the Middle West and Canada. In 1937 he was placed in charge of the Export Department, acting as export manager in addition to being assistant sales manager.

FWD Personnel Changes

Several changes of personnel in its Engineering Division have been announced by Four Wheel Drive Auto Co., Clintonville, Wis. Donald B. Olen, formerly chairman of the

Weed's eye view of cutter bar and nozzles.

CUT THEM and KILL THEM with the Cunningham
ESTABLISHED 1839

SICKLE BAR MOWER and WEED KILLER SPRAY ATTACHMENT

This new machine gives your weeds a double knock-out blow by cutting them and then spraying them in one operation. Four spray nozzles, directly behind the cutter bar, spray chemical right down to center of freshly cut plants. Special shields on trailing edge of cutter bar eliminate spray drift and keep cut weeds off ground until spray is applied.

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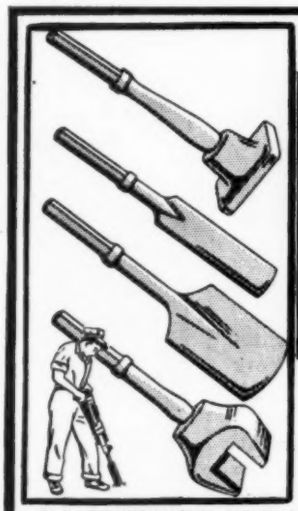
Rochester 8, New York
Reel Type and Sickle Bar Mowers • Snow Plows • Garden Tractors



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1⅛" x 6" SHANK, FITS STANDARD HAMMERS

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THE GOVERNMENT BUYS ONLY THE BEST, REPLACE YOUR OLD TOOLS AT A FRACTION OF THEIR REGULAR PRICE. THESE TOOLS ARE ARMY SURPLUS.

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REG. $9.30	CLAY SPADE 5½"x 8½"	$3.75
REG. $18.00	SHEATHING DRIVER	$6.00

ALL SHIPMENTS F.O.B. PHILA.

WILL SHIP RATED FIRMS ON OPEN ACCOUNT. OTHERS SEND CHECK.

J. JACOB SHANNON & CO.
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THE OLDEST EQUIPMENT HOUSE IN PHILA.

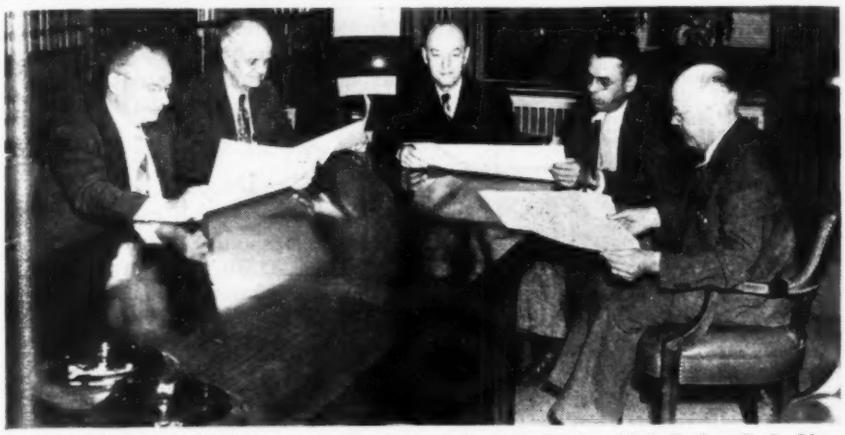
save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

C. R. JAHN COMPANY

Dept. 1345—1106 W. 35th Street, Chicago 9, Illinois

Heavy duty trailers from 5 to 100 tons

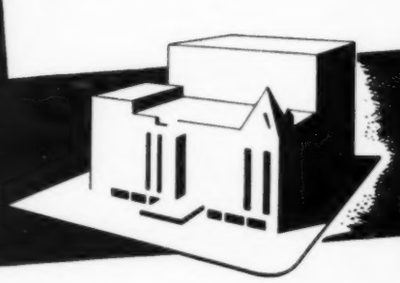


FWD's Engineering Staff, left to right: G. D. Simonds, B. G. Donley, H. B. Dodge, D. B. Olen, and James Sorenson

Manufacturing Committee, has been named director of the Engineering Division and H. B. Dodge, former director, has been elevated to technical advisor to the management of the company. G. D. Simonds, formerly manager of design engineering has been named chief engineer in charge of design of standard FWD models. B. G. Donley is manager of development engineering concentrating his efforts on specialized products. James A. Sorenson, metallurgist for the company for more than 30 years has had added to his responsibilities those of research engineer.

1000 ROOMS IN

CLEVELAND



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ROBERT P. JOYCE, GENERAL MANAGER

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Unquestionably the finest hydraulic spreader.

Hundreds more transportation companies, cities and counties are using Flink Spreaders to spread granulars in ice control and highway maintenance work. Spread forward or backing up, full or half width of street. Controlled from cab. Write for literature.

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Marion Promotes Rizor

D. E. Rizor

John P. Courtright, vice president in charge of sales for Marion Power Shovel Co., has announced the appointment of David E. Rizor to the position of his assistant. Mr. Rizor has moved to the home office of the company at Marion, O., and will work directly with the vice president in charge of sales. His new duties will permit continued close contact with friends in the Chicago area where he has been district manager in charge of Marion's Chicago office for the past 12 years. Mr. Rizor has been with Marion for 24 years and he has had broad experience in general sales and repair sales.

Bituminous Specialist

A. J. Belanger

Appointment of A. J. (Joe) Belanger as bituminous equipment sales engineer for Pioneer Engineering Works, Minneapolis, Minn., has been announced by K. E. Brunsdale, Sales Manager. Mr. Belanger will serve as a specialist on sales in the United States and Canada. Having worked on the design continuous process bituminous equipment for a number of years, Mr. Belanger is well qualified as a consultant in this field.

New Haiss Representative

H. D. Williams

H. D. Williams, 6212 Homer St., Philadelphia, Pa., has been appointed exclusive representative in eastern Pennsylvania and southern New Jersey, for George Haiss Manufacturing Co., Inc., division of Pettibone Mulliken Corporation, New York City and Chicago. Mr. Williams' organization will both sell and service the completely new and redesigned line of Haiss material handling conveyors, car unloaders and loaders. A civil engineering graduate of Maine University, Mr. Williams has had over 20 years' experience in the construction, application and sales and service of all types of material handling conveyors. Brother Ed Williams will continue to direct the sale of parts, servicing and maintenance of Haiss conveyors, as well as all types of material handling equipment, as in the past.

AED Regional Meeting

Members of Associated Equipment Distributors from throughout Texas and Oklahoma staged a day-long meeting in San Antonio on October 11 to review the year's activities and to discuss a variety of subjects pertaining to the construction equipment industry.

The conference was headed by Jewel A. Benson, Director of A.E.D.'s Region 10 (Texas and Oklahoma), and featured addresses by W. W. Bucher, Executive Vice-President of A.E.D. and Frank G. Knight, Executive Secretary.

Other subjects were the War Department Affiliation Program, credits and collections, the economic outlook for the future, and activities of the Texas Good Roads Association.

Manual of Traffic Control Devices

A completely new edition of the "Manual of uniform traffic control devices for streets and highways," prepared by the Joint Committee on Uniform Traffic Control Devices and published by the Public Roads Administration went on sale Sept. 15.

Superseding editions of 1935 and 1942, the new Manual represents a four-year effort of the Joint Committee and its staff. While basic standards generally remain unchanged, many refinements and some significant revisions have been made.

The text has been entirely rewritten and expanded to provide a clearer, more complete exposition of each subject. Proper usage of traffic control devices is illustrated by 57 drawings and photographs. In addition, 85 signs are portrayed in the margins alongside the appropriate text. Many of the drawings are in color.

The Manual can be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 50 cts. each.

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Used Erection Equipment For Sale

The following list of equipment may be inspected at the Omaha Steel Works, 609 South 48th Street, Omaha, Nebraska, and is for sale on a where-is and as-is basis for a lump sum of $1,000.00.

1—Rex self-priming centrifugal Water Pump, size 4SPCP, LeRoi Engine, Model CR-2, No. 101324, 3⅛"x4½". Pump No. CF116 mounted on skids, Co. No. N-21.

1—Jaeger 6" Centrifugal Water Pump No. P2553, Model 6APC, 4 Cylinder Waukesha engine, No. AK39YA, 3¾"x4¼", No. 343069, mounted on skids, Co. No. N-80.

1—Kansas City Haypress Co. 4" Centrifugal Water Pump, Hercules gas engine, No. 220082, 4"x4½", Co. No. N-23.

1—Sterling 2" Centrifugal Water Pump, Type U. A., Model 855, No. 78476, Co. No. N-133.

1—Curtis Air Compressor No. 89089, belt driven, Electric Motor, for power not included, Co. No. N-34.

1—Domestic Engineering Company double 4" diaphragm pump mounted on wheels No. X24897, Co. No. N-20.

1—Stroudsberg Engine Company Steam Engine 4"x5", double drum, 16" wide, 9" dia., 2½" rim No. 4090, Co. No. N-14.

1—Gardner 4" Steam Driven Water Pump, 7"x6"x10", No. 69729, Co. No. N-19.

1—Fairbanks-Morse Steam Driven 5¼"x3½"x5", No. 7195, Co. No. N-22.

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609 South 48th Street OMAHA 6, NEBRASKA

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- **New double strength trunnion shafts with brackets and bushings.**
- **New rear axle drive shafts.**
- **New and slightly used six cylinder engines.**
- **Also many other parts for same.**

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FOR IMMEDIATE DELIVERY

Subject to Prior Sale

FACTORY NEW SHOVELS AND DRAGLINES:

1—Lima 802 shovel 2 yd
1—Lima 604 shovel and dragline 1½ yd
1—Lorain L-41 dragline ¾ yd
1—Bay City 34 dragline ¾ yd
1—P & H 255-A shovel and dragline ⅝ yd
1—Bay City dragline 1¼ yd

USED SHOVELS AND DRAGLINES:

1—Lima 1201 dragline 3½ yd
1—Lima 802 shovel 2 yd
1—P & H 855 PLC dragline 3½ yd
2—Northwest 80-D shovels 2½ yd
1—Lorain 80 shovel and dragline 2 yd
1—Lorain 79 shovel and dragline 1¾ yd
2—Lorain L-41 dragline ¾ yd
1—Link Belt K-48 dragline 3 yd
1—Northwest 6 shovel and dragline 1½ yd
1—Northwest 6 dragline 1½ yd
1—Bay City 44-B shovel and dragline 2 yd
1—Lorain 30 shovel ½ yd
1—Northwest 105 shovel and dragline ⅞ yd
1—P & H 150 dragline ½ yd
1—Northwest 105 hi-lift shovel ⅞ yd
1—Browning dragline ⅝ yd
1—Lorain 40 shovel-backhoe and dragline ¾ yd
1—Insley K-12 dragline ½ yd

FACTORY NEW TRACTORS:

1—Allis-Chalmers HD-19 w/ angledozer
1—Allis-Chalmers HD-19 w/ cable bulldozer
1—Allis-Chalmers HD-7 w/ hydraulic bulldozer
1—Allis-Chalmers HD-5 w/ hydraulic bulldozer
2—International TD-18 w/ hydraulic angledozer
1—International TD-18 w/ cable angledozer (used 120 hours)
1—International TD-18 w/ hydraulic angledozer & ddpcu in rear (used 350 hrs.)
1—Caterpillar D-6 w/ front mounted pcu & bulldozer, lights, generator & starter (used 410 hrs.)

USED TRACTORS:

2—Caterpillar D-8 w/ ddpcu & angledozers, in 1H 8090's series rebuilt
1—Caterpillar D-8 w/ ddpcu & bulldozer, in 1H 8230's series rebuilt
1—Caterpillar D-7 w/ hydraulic angledozer & Hyster logging winch, in 3T series
1—Caterpillar D-7 w/ cable bulldozer, in 9G series, rebuilt
2—International TD-18 w/ hydraulic bulldozers
1—International TD-18 w/ cable angledozer
2—International TD-14 w/ ddpcu & cable angledozers (used 1100 hrs.)
1—International TD-9 w/ Bucyrus-Erie hydraulic bulldozer
2—Caterpillar D-4 w/ hydraulic angledozer & Hyster logging winches

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Immediate Delivery

1—Used "Caterpillar" 12 ft. Pull Grader

1—Used Allis-Chalmers Model HD14 Tractor w/Cable Angledozer

1—Used LeTourneau Model J8 Scraper

1—Used Buckeye Model 70 Dragline and Shovel

1—Used International Model TA-40 Tractor

1—Used Gar Wood Model 25 Scraper

1—Used Air Compressor, 160 cfm.

1—Used Portable Air Compressor, 60 cfm.

1—Used Allis-Chalmers Model E-60 Power Unit

1—Used LeTourneau YR Scraper

1—Bros Pneumatic Rubber Tired Roller

1—Used Allis-Chalmers Model W Patrol

1—New Kwik Mix 6-S Concrete Mixer

2—C.I.C. Drag Conveyors

1—Novo Traffic Line Markers

1—New Novo Standard Pavement Breaker

1—New Kwik-Mix 3½-S End Discharge Concrete Mixer

1—New Buckeye 9' Spreader

1—Used Carco Towing Winch for Model HD14 Tractor
Various size pumps, gas engines, rotary scrapers, and slip scrapers

1—Kwik-Mix 3½-S Side Discharge Concrete Mixer

1—Portable Repair Shop equipped w/Arc Welder, Air Compressor, 3 KW generator, front mounted winch w/10' portable boom, pipe vise, 4 retractable drop cords, 2 built-in work benches, completely enclosed in van type body in which there is a gasoline heater for working in cold weather. Sides of the van open up which provides a work bench extending along both sides and rear of van. Entire unit mounted on General Motors 6 x 6 truck which has been driven less than 3000 miles.

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1—Barber-Greene Asphalt Plant Dryer
Serial No. 830-3-1
Excellent Condition

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ANDERSON EQUIPMENT CO.

Merchants National Bank Building
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FOR SALE

Used Contractors Equipment, Subject To Prior Sale

1—Blaw-Knox Clamshell Bucket, 1¼ cu. yd., wide Barge Type. First Class.
1—Page ½ cu. yd. Dragline Bucket, Type RH. Good.
1—International pneumatic tired Tractor, Model I-9. Good condition.
1—Bros Giant Sheepsfoot Roller, G2. Dual drums, like new.
1—Adams Heavy Duty Road Ripper. Good condition.
1—Blaw-Knox 2 compartment 51 ton Aggregate Bin, equipped with two material weigh batchers. Good condition.
1—Jaeger Concrete Spreader. Adjustable 20' to 22', new 1942. Good condition.
1—Ingersoll Rand Air Compressor, Model D60-2, on pneumatics for trailing. Very good condition.
1—Insley Dragline ⅜ cu. yd. Model K10, Serial No. 178, equipped with 30' boom. With an Insley Trailer and a ⅜ cu. yd. dragline bucket.
1—Williams 2 cu. yd. Dragline Bucket, Model GP1. Fully equipped. Completely overhauled.
1—Page 2 cu. yd. Dragline Bucket, Model R. C. Automatic, fully equipped.
1—Jahn 22 Ton Single Purpose Trailer, Model 622T. Equipped for hauling 15B Bucyrus, 25 Northwest or 304 Koehring. Brakes are mechanical. Never been used.
1—Buckeye Spreader Box, 10 foot, Model 10S, on steel wheels, overhauled.
1—Carr Form Grader—A36, overhauled.
1—5 Ton, 3 Wheel Huber Roller, overhauled, good condition.
1—5" Deming Single Stage Centrifugal Pump, gas engine driven, mounted on pneumatic tires.
1—4C Dumpcrete, nearly new.
1—Gorman Rupp Road Pump, Model R100, good condition.
1—28S Koehring Stationary Mixer, Electric Motor driven. Complete with charging hopper. Recently overhauled with new liners, drip rings, buckets and discharge chute—excellent condition.
1—5 K. W. Le Roi Light Plant. A. C. Model, 5AD91P. Good as new.
1—125 H. P. Broderick Boiler. Carries Hartford and Nebraska State certificates to work at 175 lbs. pressure. Recently reflued. Oil fired, and completely equipped with oil burner accessories.
3—Woolridge Terra Cobra Scrapers, 14 cu. yd. Used 2 seasons, good working condition.

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1 Model RTX All-Purpose Spreader

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1—½ yd. Model 514 Unit shovel, gasoline driven, New 1942 .....$5,750.00
1—Model 255A P&H ¾ yd. Shovel, gasoline driven with dragline attachment, New November 1946 .....$11,000.00
1—315 cu. ft. LeRoi Air Compressor, gasoline driven on 4 pneumatic wheels, New August 1946 .....$4,000.00
1—Model "H" Junior Rapid Paving Breaker, New August 1946, used 2 weeks $2,750.00
3—LeTourneau Super C Scrapers, less than 1 year old, used 3 months, $17,000.00 each.
1—Diamond Vibrator, 3x10 double deck, New.....$1,200.00
1—24" Samuel No. 44 double surfacer Triumph Planer, New $2,100.00
1—"UTI" Minneapolis Moline industrial Tractor, New 1947..$4,000.00
1—"UTI" Minneapolis Moline Industrial Tractor with Lull 2D Loader, New 1947.....$3,900.00
1—C114 La Plant-Choate Scraper, New 1947 .....$6,000.00
1—Marvel Spray Machine, TJ200 gal., New 1948 .....$640.00

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Michigan C-16, ½ yd. Dragline and Backhoe, 35' boom, wide cats, same as new. Will accept work for machine in the South.

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1—Allis-Chalmers Model "WK" Gasoline Tractor, Serial #4899 complete with Baker Hydraulic Model 206 Double Action Bulldozer Serial #667. REBUILT in perfect operating condition.
1—Allis-Chalmers Model "WK" Gasoline Tractor, Serial #8450 complete with Gar Wood Model RBDX Hyd. Bulldozer, Serial #3841 with dual valve Rear Mtd. Hyd. System. REBUILT—In perfect operating condition.
1—Allis-Chalmers Model HD7W Diesel Tractor Ser. #13212 complete with large Idlers & equipped with Gar Wood Model RBBX Hyd. Bulldozer, Front Pump Operated, Ser. #21365 and Gar Wood Model 25, 2 wheel Hyd. Scraper, Ser. #21425. REBUILT—In perfect operating condition.
1—Allis-Chalmers Model HD7W Diesel Tractor, Ser. #9702 complete with large Idler & equipped with Gar Wood Model RBDX Hyd. Bulldozer, Front Pump Operated, Ser. #14444. REBUILT—In perfect operating condition.
1—Allis-Chalmers Model HD7W Diesel Tractor Ser. #11100 equipped with Cut Out Shoes and Gar Wood Model RBCX Hyd. Dozscaster. REBUILT—In perfect operating condition.
1—Caterpillar "50" Gasoline Tractor, Ser. #5A-843 in perfect operating condition.
1—Allis-Chalmers Model A Wheel Tractor, Engine Serial #46783, as is, where is.
1—Silver King Wheel Tractor with Hercules IXB 4 cyl. gasoline engine Ser. #413383, complete with 5 ft. mower, in good operating condition.
1—Allis-Chalmers Model 110 Pull Type Blade grader, Serial #1-A-79. Mounted on 7.00 x 20 pneumatic tires. REBUILT, in perfect operating condition.
1—Caterpillar Model 10 Motor Grader Ser. #9A90 complete with dual rear pneumatic tires, & cab, as is, where is.
1—Buckeye Model 12 Ditcher, Ser. #50 complete with 14" buckets with center and side rooters for 21" cutting, powered by Buda HP 326 gasoline engine (Purchased new March 1947). In perfect condition.
1—American Model 350 ½ yd. Crawler mounted Combination Shovel and Clamshell, Serial "GS-353 powered by Wauk. CHS12B Gasoline Engine Serial #406527. In good operating condition.
1—LaCrosse Model DF6-16 16-ton Pneumatic Tired Road Trailer, Ser. #582. vacuum brakes, (8) 7.50 x 15 tires on rear, (4) 8.25 x 15 dual fronts. In perfect operating condition.
1—Page "RC" ¾ Cu. Yd. Dragline Bucket, Ser. #3-2971. In good operating condition.
1—Stang Mill Point System complete with 6" Pump, 43 point, 300' 8" Header Pipe, 100' 8" Discharge Pipe, Risers, Swing Joint, 8" Ells, T's, Gate Valves, Caps, Header Couplings all complete. In perfect operating condition.
1—Gorman Rupp "R80" Triplex Road Pump, Ser. #10077 complete with LeRoi Model D201P3 gasoline engine Serial #104069 all mounted on 4 steel wheels. REBUILT—In perfect condition.
2—Worthington 105 ft. Portable Air Compressor, gasoline engine driven. In perfect operating condition. One on 4 pneumatic tired wheel. One on 2 pneumatic tired wheel.
1—Worthington 60 ft. Portable Air Compressor gasoline engine driven. In perfect operating condition.

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400 W. LAKETON AVE. MUSKEGON, MICHIGAN

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1—Le Tourneau Dowlle
Drum Power Control Unit

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DANVILLE ILLINOIS

"Caterpillar" 35 Tractor with Angledozer. International TD40 W.G. Tractor Caterpillar. No. 12 Motor Grader. Huber 5-7 ton Roller. Assortment of ¾ and 1 yd. Clam Buckets.

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1—6DC 844 Buda Diesel power unit, 120 H.P. New. At greatly reduced price.
3—ME-6 Murphy Diesel power units, 135 H.P.

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Vulcan 3000# drop hammer
American 10" elec. sump pump
Int. I-4 with Hough loader
Butler Carscoop

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Caterpillar 12 Motor Patrol	$7,500.00
Caterpillar D4 Bulldozer	3,250.00
Caterpillar 75 Diesel Bulldozer	4,250.00
Caterpillar D4 Hilift T4 Tractor	4,250.00
International TD14 Tractor	3,000.00
Huber Road Maintainer	1,250.00
Adams 51 Diesel Motor Patrol	1,250.00
Le Tourneau Model G 6 yard Scraper	1,250.00
International T9 with B.E. Hilift	4,450.00
Allis Chalmers H.D14 Bulldozer	3,750.00
Allis Chalmers W.K. with Winch	950.00
La Plante Choate 2 yard Hydraulic Scraper	750.00
Case S. I. Tractor	850.00
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GYRATORY: 30" Super. McCully; 36" Allis-Chalmers; also Nos. 12, 10, 9, 8, 7½, 6, 5, & 4.
JAW TYPE: 24x36, 25x40, 22x50, 40x42, 42x48 and smaller sizes down to 7"x9".
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ROLLS: Allis-Chalmers 72x30, 54x24, 54x20, 40x15 & 18x10. Pioneer 18x30. Universal 16x24. New Holland 24x16 & 16x16; McLanahan 30"x60", 18x 24 & 18x30 Single Roll. Also others.
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MILLS: Hardinge 3'x8", 6'x22", 8'x3', 8'x3' & 8'x4'; Kennedy 4x8, 5x6, 5x11; Marcy 4x5, 6x4; Smidth 16B Tube Mills; Raymond 4 & 5 Roller Mills; Bonnot, Fuller, Sturtevant & others.
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Must be seen to appreciate.

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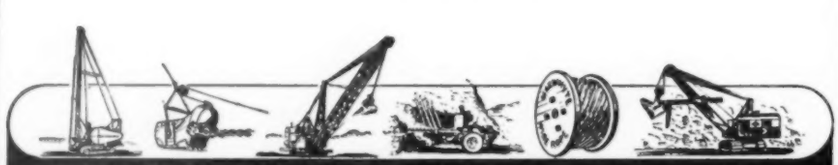

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- 1 Bins and Hoppers
- 2 Conveyors
- 3 Crushers
- 4 Portable Plants
- 5 Screens

II BITUMINOUS:
- 6 Batchers
- 7 Finishers
- 8 Distributors
- 9 Dryers
- 10 Heaters
- 11 Plants (central)
- 12 Plants (travel)

III CONCRETE:
- 13 Batchers
- 14 Buggies and Carts
- 15 Finishers
- 16 Joints, Expansion and Contraction
- 17 Mixers (under 1 yd.)
- 18 Mixers (1 yd. up)
- 19 Pavers
- 20 Reinforcing Steel
- 21 Road Forms (1000' set)
- 22 Tower
- 23 Truck Mixers

IV CRANES:
- 24 Crawler Mounted
- 25 Truck Mounted
- 26 Piledrivers

V GRADERS:
- 27 Blade, self propelled
- 28 Blade, pull type
- 29 Blade, under truck
- 30 Elevating

VI LOADERS AND TRENCHERS:
- 31 Front-end loader (tractor mounted)
- 32 Loader, bucket type and belt type
- 33 Trencher or Ditcher

VII HAULING EQUIPMENT:
- 34 Dump Truck
- 35 Other Trucks
- 36 Dump Wagons, tractor drawn
- 37 Flatbed Trailers

VIII PUMPS:
- 38 Centrifugal
- 39 Diaphragm
- 40 Piston

IX POWER UNIT: (Independent)
- 41 Gasoline
- 42 Diesel
- 43 Electric

X ROLLERS:
- 44 Power (Smooth)
- 45 Pneumatic Tire
- 46 Sheepsfoot

XI TRACTORS:
- 47 Crawler
- 48 Rubber Tired

XII TRACTOR EQUIPMENT:
- 49 Bulldozers
- 50 Power Control Units
- 51 Rippers
- 52 Scrapers, tractor drawn
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XIII BUCKETS:
- 54 Clamshell
- 55 Concrete
- 56 Dragline
- 57 Orange Peel

XIV SHOVELS AND DRAGLINE:
- 58 Crawler (under 1 yd.)
- 59 Crawler (1 yd. up)
- 60 Truck Mounted

XV ROCK DRILLS AND AIR TOOLS:
- 61 Air Compressors
- 62 Backfill Tampers
- 63 Clay Diggers
- 64 Concrete Vibrators
- 65 Drills, cable tool
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- 87 Highway Guard
- 88 Snowplows, rotary
- 89 Snowplows, v or wing

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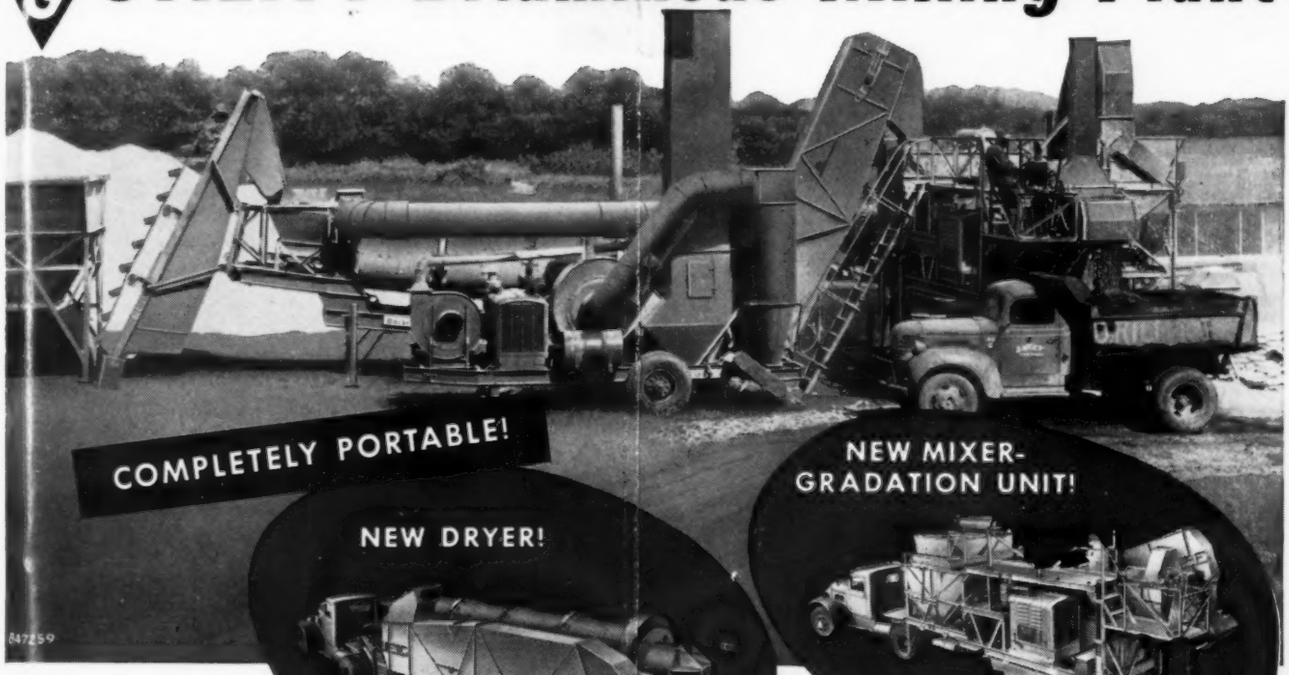
Barber-Greene

BG UTILITY Bituminous Mixing Plant



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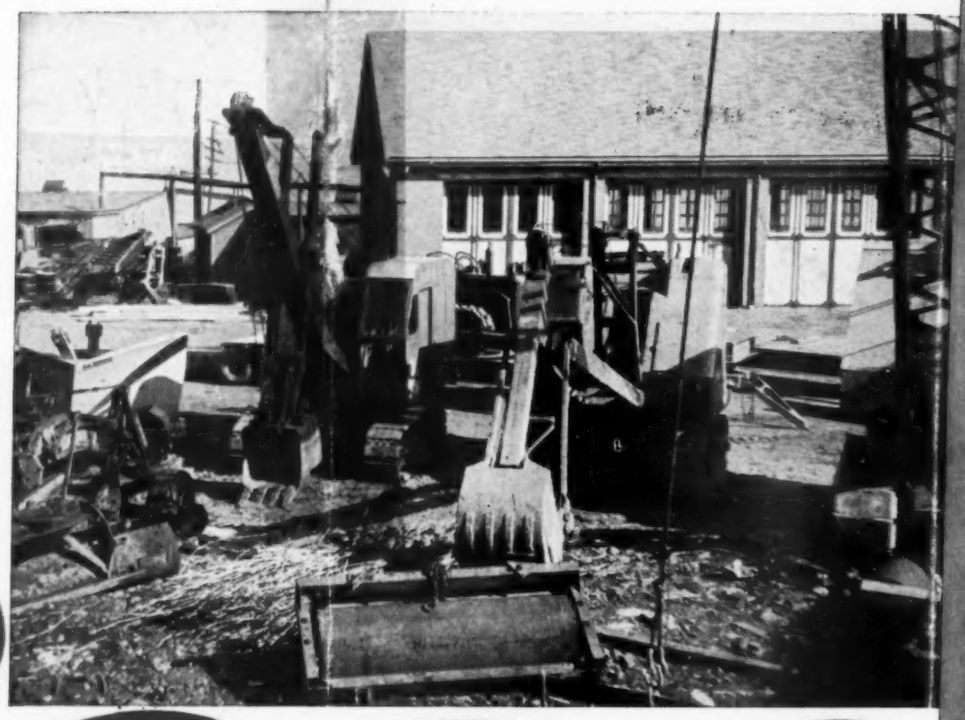

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